City of Tigard

GIS Needs Assessment

FINAL

June 2007

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City of Tigard
GIS NEEDS ASSESSMENT

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TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

In the winter of 2006, the City of Tigard completed its Strategic Plan for a comprehensive core GIS infrastructure at the City. In early spring 2007, the City embarked on Phase 2 of the GIS project, Analysis and Design. The first component of Phase 2, the GIS Needs Assessment, is detailed in this document.

The purpose of the GIS Needs Assessment is to gain understanding of people's business needs for GIS and to use these requirements to develop a clear vision that will guide recommendations, priorities, and actions for GIS development at the City. The foundation for the GIS Needs Assessment was a series of workshops conducted at the City, involving key business areas. The business areas often crossed departmental boundaries and included participation from dozens of City employees. The business areas covered in the workshops were:

- Addressing
- Utility Management, including Water, Sanitary, and Stormwater
- Street System, including Pavement Management
- Facilities Management
- Land Use Planning and Permitting
- Police Patrol, Community Policing and Crime Analysis
- Disaster Planning
- Library Services

This document outlines detailed user requirements for GIS in each of these business areas, as well as the problems and issues; opportunities; data design impacts; and priorities that will influence overall GIS development and implementation at the City. Although the GIS Needs Assessment workshops focused on specific business area needs, the combined results of the GIS Needs Assessment, more importantly, begin to reveal many common needs across business areas, as well as common issues and priorities. These common needs, issues, and priorities allow the development of an outline for directions, activities, and projects that will be needed to support the business requirements for GIS at the City of Tigard.

From the GIS Needs Assessment, we began to get a clear picture of the customers' vision for GIS, from a business perspective. The vision is also broken down into more detail with 4 general groupings, in order to provide additional structure for the discussion, planning, and implementation. The 4 groupings are: spatial data; organization and support; applications and tools; systems and architecture. These groupings will also be used in the development of the GIS Recommendations.

GIS VISION

The overall vision for Tigard's GIS, as seen by the internal customers, is clear. They envision a GIS that effectively supports their priority business activities with high quality data, tools, support, and integration with business systems. The GIS supports a broad array of users, from the casual map viewer to the skilled analyst. GIS use will continue to grow in Tigard, presenting a need to serve many more people with simple and consistent GIS tools. Achieving the vision presents many challenges. It will require departments working together to set priorities and to create strategies and projects that can make the vision a reality over time. More detailed vision in key areas begins to clarify directions for the planning process.

Spatial Data

Data and Information Management is seen as the key to Tigard's success in GIS. The data in the GIS will be up-to-date, reliable, and well managed in a corporate Geodatabase. Use of the information will be supported by documentation that is concise and easily accessible by all staff. Users will have access to data created within Tigard, as well as regional data from RLIS, Washington County, and other data sources external to the City. Information management and access will be made easier by the availability of tools and processes that assist and guide staff. Roles and responsibilities for spatial data entry and management will be shared among departmental data stewards and guided by the GIS Coordinator.

Organization and Support

The GIS Steering Committee will work closely with the GIS Coordinator to develop yearly work plans and funding strategies for GIS that accommodate changing needs and new users. Core GIS functions, such as viewing, research, spatial data management, and support will be funded for the City. The GIS Steering Committee will actively communicate with their GIS users about funding, projects, system upgrades, training, and other significant issues. As well, the various levels of GIS users (e.g., power users, casual users) will have access to training and support, and will understand the roles and responsibilities associated with those functions.

Applications and Tools

A desktop replacement for MAGIC will be created and made available to all GIS users. The design of this application will begin with a thorough assessment of user needs and ensure that the desired functionality from MAGIC is duplicated and that new functionality is added. The application will have enhanced mapping capabilities and access to the most current information in the corporate GIS data set. This application will support many of the everyday research and mapping needs of the Tigard staff for GIS. The application design will take into account the overall GIS architecture and ESRI software directions, to ensure long term success. Individual business priorities in the departments, including field needs and other special requirements, will be supported by additional GIS projects that are coordinated within Information Systems and fit with departmental standards and work plans.

Systems and Architecture

The infrastructure and architecture in Tigard will create the best possible working environment for the GIS users, including optimal software, applications, and performance. It will start with sound Geodatabase organization and design. The Geodatabase(s) will be sensibly organized for spatial data management and deployment. To simplify data management, replication of layers will be avoided. Themes will be logically organized into spatial data categories that are thematic rather than by business area (for example, buildings will be organized into the "infrastructure" dataset rather than "disaster management"). The Geodatabase will have strict controls for editing. Protocols for creating and managing data will be documented.

Tigard's asset management and work order system (Hansen), financial system/water billing system (Springbrook), and permitting system (Tidemark (Accela)) systems will continue to be primary repositories for address, asset, billing, and permitting data, with the information readily available via GIS. The connections between Hansen and GIS will be streamlined and, as much as possible, appear seamless to the GIS users. GIS will be integrated, where possible, into the daily

business of Tigard and support departmental priorities for land use planning; asset management and maintenance; land use planning; police; disaster planning and response; and other City services. In addition, GIS will be used as a tool to support a high level of service for the public, via public counters and, in the future, the Web.

The GIS Requirements and Vision have provided an excellent foundation for developing a series of recommendations, actions, and strategies that will support the business needs for GIS at the City of Tigard now and in the future. The following document will also act as a key resource to support the data assessment, high level Geodatabase design, and data pilot projects.

CHAPTER 1.
ADDRESSES

OVERVIEW

Addresses impact every area of business in the City of Tigard. They are a vital component of the development, maintenance, and use of the City's GIS. The most common way to identify location within a City is by using an address. When a citizen comes into the City of Tigard, they describe their property using an address. The City's permit system requires an address in order to process and issue a permit. Addresses are used to bill for utility consumption and to help maintenance workers get to the right location for their repairs and inspections. Most importantly, the 911 system relies on addresses to respond as quickly as possible to emergency calls for Police and Fire.

Owing to the many ways that addresses are used within a City, there are often differing views of what constitutes an address. In the address workshop, people described the need to find many locations that may not actually have an address, such as water meters or street bollards. However, for the purposes of this review and analysis, we will focus effort on the City's primary address base as the site address point locations that the City maintains through the permitting system (Site Address). Other location needs will be addressed in their specific business areas. We will also briefly describe, and show the relationships with, the additional sources of addresses that are used in the City of Tigard.

The City's Primary Address Base:

- Point site address maintained via the permit system and AutoCAD map annotation layer
- These are addresses for every built location in the City. The permit system contains the building address, as well as suite or individual condominium addresses.
- In most cases, vacant parcels are not given a Site Address
- Site Addresses are mapped on an AutoCAD map layer as annotation. Suites and unit numbers are also located.

Additional Address Sources:

- Washington County—property owner addresses
- Springbrook—Utility Billing addresses (close coordination with permits)
- WCCCA—911 Response System address network
- Portland Metro address network - PPDS Police Reporting system

New addresses originate at the City's Community Development Department. They are created based on the Portland grid system. Most commonly, this process is triggered upon the construction or modification of a building, and occurs prior to entering a project into the permitting system. In other instances, new addresses are created to resolve confusing historic addresses that do not conform to the Portland grid system. New or changed addresses are fed into the permitting system and this information is shared with other businesses (such as the cable companies) and governments (Washington County).

The following report will describe user requirements for Site Addresses, draft the business process flow for Site Address maintenance, and define issues identified in the address workshop. The report will

conclude with a summary of the highest priorities for optimizing the maintenance and use of Site Addresses in the City.

USER REQUIREMENTS

User requirements are the driver behind good design and application development in GIS. Addresses are used by every department in the City and the design must take into account system connections and ties to business processes. Even if the City does not have the capability to control all address sources used in the City, it does have the ability to maintain a Site Address that can be widely and consistently used by City staff and systems, as well as improve addresses in vital external systems such as WCCCA, PPDS, and Washington County's parcel file. In addition, the Oregon State Geospatial Addressing Standard (November 5, 2004) recommends that cities develop a "geospatial dataset of situs address points." The City already has an excellent base toward achieving this goal. User requirements, combined with the State guidelines and good design, will result in a site address base that supports City business at many levels.

User Needs

In the largest workshop on our schedule, City of Tigard staff provided a lot of information that shows the importance of good site addresses in their business. The following is a listing of the requirements that were specific to site addresses. Other needs to locate assets and features that may not have addresses will be discussed later in this document in their appropriate business area. For example, water meters will be discussed in the Water business area and bollards will be discussed in Assets.

All Business Areas:

- Have access to a single master source of site addresses that supports all City systems that use a site address
- Confirm locations for citizens at the public counters and over the phone
- Provide ability to search for a facility, asset, or area of interest by address
- Locate City documents by address
- Use address as the primary search vehicle in GIS based applications (like MAGIC)
- Provide ability to do site address mailings
- Support address verification for addresses outside the Tigard city limits (e.g. Water distribution, Library Services) for billing, maintenance, and eligibility verification

Utilities:

- Assist field staff in finding service request and maintenance locations Confirm site addresses for Utility billing
- Support address location for work orders in Hansen
- Support asset location in Hansen

Community Development:

- Correctly identify sites for permit requests
- Maintain the most precise address location possible for the City (Site, including suites and units)
- Maintain the site address in the permit system

- Maintain the physical address location in an automated mapping environment that is tied to the permit system address
- Conduct analysis, such as buffer analysis
- Search to find a permit location by address
- Maintain condominium addresses according to State of Oregon condominium regulations and workflows.
- Improve ability to track addresses for condominium conversions
- Address tracts, when needed
- Track addressing changes, such as commercial sublets.
- Provide improved site location for regional systems (such as PPDS, Library) through updates to Metro's address street network
- Coordinate with Telco and Cable, PG&E and other external agencies that provide City services
- Notify external agencies of site address changes

Police:

- Improve the police reporting addresses in PPDS
- Support crime analysis
- Improve WCCCA 911 service support by providing more precise addresses
- Support the Crime Mapping Web application search capabilities

Risk:

- Locate customer complaints for risk management
- Locate claims
- Have good addresses tied to the new Risk database system

IT:

- Develop an address standard that follows the State Geospatial Addressing Standard

Problems and Issues

While City of Tigard has made excellent progress in the development and maintenance of site addresses, there are a number of key problems that were expressed:

- There are not always site addresses for vacant properties and other significant properties that are not served by the US Postal Service. This has been influenced by the need to notify the Post Office, who wants only addresses that receive mail.
- There are not always site addresses for rights of way
- Areas outside the City are not as well covered for site addresses (service areas for utilities, in particular)
- PPDS does not recognize intersections of private streets with public streets as intersections that would support location of incidents

- The City uses the Metro street network for geocoding—is this good enough?
- The AutoCAD file which contains site address locations is not directly usable in GIS applications
- The GIS shape file for site address locations is partially complete and was derived from the AutoCAD file
- Hansen is not supported by a connection to Tigard site addresses or valid street names
- There is no means of automated comparison between Springbrook, Hansen, and Tidemark

Opportunities

There has been a lot of work done in the area of site addresses, but there are also great opportunities to refine the resource and optimize its use in the City via better integration with existing systems and with GIS applications, without abandoning the permitting system as the primary repository of addresses. The State's vision of a city "geospatial dataset of situs address points" is well within reach for the City of Tigard and there are a number of goals and actions that will support the effort:

- Create a well designed GIS site address layer that can be maintained using the Tidemark addresses as a source, with documented maintenance procedures
- Determine the spatial area that will be covered by site addresses
- Use the AutoCAD site address layers and Tidemark addresses as input to the GIS site address design
- Use the State address standard as a model for Tigard site addresses and customize, if necessary, to accommodate specific business needs
- Use the conversion to Accela as an opportunity to re-design the address fields in the permit system (to better match the State address standard and better function in GIS)
- Use the GIS data assessment as an opportunity to evaluate the Hansen address needs and limitations. There may be a way to do better address and street name verification to the site address base.
- Use the development of a Risk data system to tie in site addresses, as needed
- Consider the importance of site addresses and location in the design of the document management system
- Use the point site address file as the primary tool for address geocoding at the City. The Metro street network may also be used, but may not be necessary since the City does not have responsibility for dispatch.
- Use the point site address file to support site address mailings for the City
- Expand site addresses to include vacant properties and other unaddressed properties (as needed), identifying these properties so that they can be exempted from reporting to the Post Office.
- Coordinate with Washington County to improve their Assessor file site addresses, particularly outside City limits

Data and Design Impacts

As this project moves forward into recommendations for solutions and action, there are several areas of data and design impact that must be looked at. Since every business area expressed a need for good site

addresses and there are many system designs, revisions, and additions occurring at the City, including GIS changes, these are even more vital to consider. Most of these have been mentioned in the previous sections, but they are summarized here together:

- Accela table and attribute design for addresses is key to building the site address base
- Hansen data design and needs must be investigated in the data assessment phase to determine what is possible
- Investigate the possibilities with Springbrook and possible automated address comparison
- The GIS design for the address base should support input to other systems, as well as data comparison and checking.
- The State's address model can be used to guide the table and attribute content for Tigard site addresses
- Take addresses into account as a component of the new document management system
- Take addresses into account in the selection and design for the City's new risk database system

BUSINESS FLOW

The City has developed some very good processes within the addressing business area. A commitment has been made to store the most precise level of address possible, at each developed site in the City, and the data is very well maintained. The City's permitting process for subdivisions and partitions is the business trigger for new addresses. The City's permit system supports the maintenance of this address file within its existing structure. The maintenance is centralized in Community Development and overseen by Bethany Stewart, an Engineering Technician. Within the City, Bethany coordinates with Amanda in Utility Billing regarding site addresses and suite numbers. Other systems and applications, including Hansen, MAGIC, the Clerk's index, and Risk Management, require addresses to support them; however, there are not any automated linkages between these systems. Attempts have been made to develop a mapping base to make the site addresses available by location. Currently, there are two parallel methods being used; an AutoCAD annotation system and a GIS point shape file. Bethany Stewart updates the AutoCAD annotation file when a new address is added or when an address is changed. The GIS point shape file is an extract of the AutoCAD file that is used in MAGIC and other GIS applications.

Figure 1-1 shows the existing business flow for address updates, maintenance, communication, and connections to other systems. The initiation for new addresses and the flow into the permitting system work well. Notification of external agencies is also consistent and effective. There are a few key problem areas where the process breaks down, as labeled on the diagram.

Workflow: Mapping Base Problem Areas:

- The AutoCAD annotation layer is a good, well maintained spatial reference but it lacks the database intelligence to support access by other systems and applications.
- The GIS shape file is derived from the AutoCAD annotation layer to build a spatial connection to other systems. This file is usable in GIS but cannot support a design that allows for a streamlined relationship with the table structure from the permit system.
- The data duplication between AutoCAD and GIS is unnecessary and creates additional workflow processes that could be eliminated.

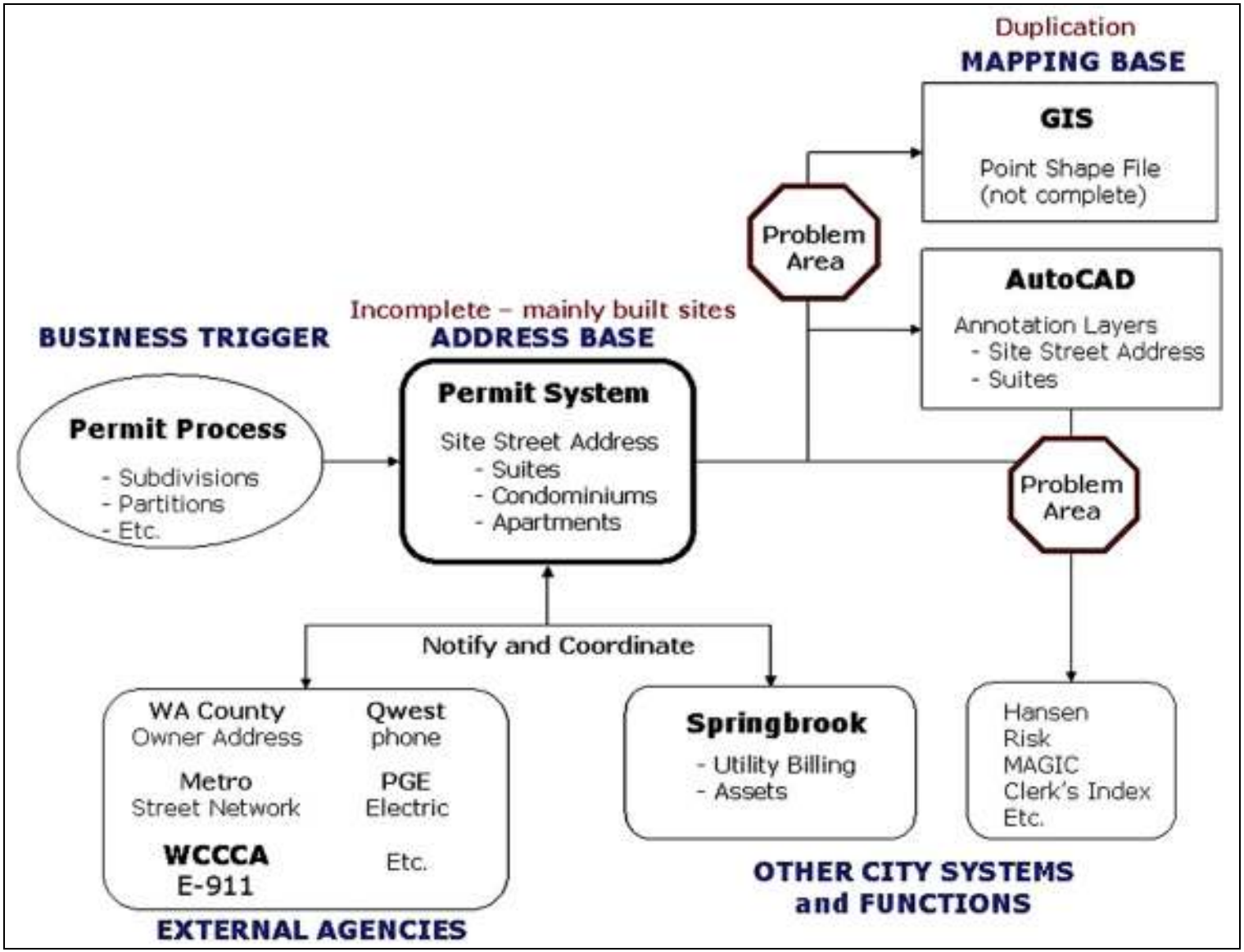

Figure 1-1. Address Business Flow—Existing Process

Workflow: Address Base Problem Areas:

- The site address base in the permit system is incomplete. Built sites are included, but few of the vacant parcels are addressed.
- The address base cannot be used to support other City systems, such as Hansen.

Details about changes to the business and data flows will be addressed in the Recommendations document. However, at a high level, we know that a conscious design of the flow between the permit system address base and the GIS mapping base is needed. The redundancy between the AutoCAD annotation map and the GIS shape file should be eliminated by creating a good design in GIS that is better tied to the permit system. The address support for other systems will be supported through the GIS mapping base, which will likely be created using a Geodatabase. Figure 1-2 shows the simplified business flow approach at a high level. As our work progresses, we will build this approach into the recommendations, data, and design work.

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for site addressing in the City of Tigard, based on expressed common needs and overall GIS design implications. This section summarizes the highest priorities for site addressing in the City of Tigard, based on expressed common needs and overall system design implications. These priorities will guide the recommendations for this project, as well as the approach for the data assessment and high level GIS design work to follow.

All business areas expressed the need for a complete, single source of site addresses that can be integrated with existing systems and accessed spatially via a GIS interface. This need is directly compatible with recommendations by the Oregon Geospatial Addressing Standard. The current site address database has some excellent qualities, including a high level of staff attention to maintenance, combined with a process, content, and storage location that are part of an existing City business process. The most significant problems occur in several major areas. First, the database is incomplete, lacking parcels that are not served by the US Postal Service and those that are within the service areas, but outside City limits. This creates gaps for use by utilities, parks, risk, and overall asset management, in particular. The mapping base for the site addresses is maintained in AutoCAD and exported to a shape file. Finally, the design does not accommodate effective use in GIS, nor does it allow for any integration or automated interaction with other systems within the City, such as Hansen, Springbrook, and others.

The current GIS planning and design work, along with new and re-designed systems coming on board at Tigard, offer some excellent opportunities to fine tune and optimize the site address database. The site address database in the permit system can be assessed and, if needed, re-designed during the Accela conversion. The new Risk management database and Document Management system can take advantage of considering the site address database in their requirements and design. The GIS data assessment can provide a new look at the possibilities for interaction between the site address database and the Hansen addressing model. The data assessment will also confirm the gaps in the site address content, thereby allowing the City to decide what content updates are most important and to develop a project to complete the database, as needed. The GIS design will present a new model for site addresses in the Geodatabase that takes into account City needs and systems, as well as State addressing standards.

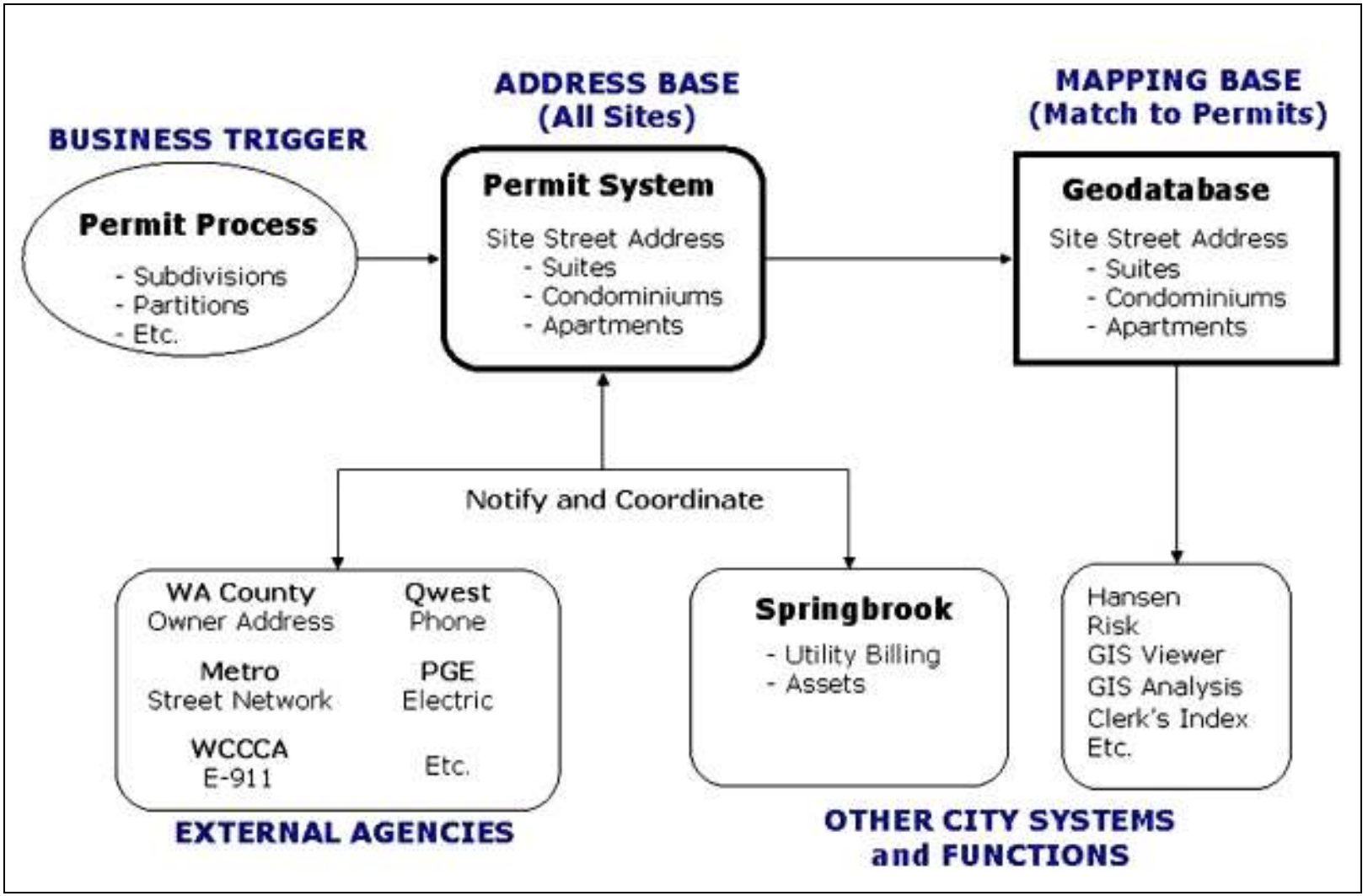

Figure 1-2. Address Business Flow—Proposed High-Level Approach

CHAPTER 2.
WATER SYSTEM

OVERVIEW

The City of Tigard Water Service Area (TWSA) includes the Cities of Durham and King City, a majority of the City of Tigard and unincorporated areas of Washington County outside the Tigard City limits. The City provides drinking water to approximately 56,000 people through approximately 17, 600 residential, commercial and industrial service connections. The primary business function of the Public Works Department Water Division is to provide adequate drinking water to the public that meets or exceeds U.S. EPA and ODHS water quality standards; the continuous operation and maintenance of the water distribution system, and to provide support services to the Utility Billing Division regarding meter installation/maintenance and indirectly the collection of fees and charges related to the water service area.

The Intergovernmental Water Board (IWB) consists of five members and was established through an intergovernmental agreement between the cities of Tigard, Durham, and King City and the Tigard Water District. Each jurisdiction is represented by a member and one member is appointed at large.

The purpose of the IWB is to make recommendations to the Tigard City Council on water issues and to carry out other responsibilities set forth in the agreement. The Tigard City Council governs all city activities including the Public Works Department Water Division and the Finance and Information Technology Department Utility Billing Division.

In the daily business of the maintenance, inspection, and planning for the water system, there is an ongoing need to know about locations of the utility systems. Staff often gets requests from the public (e.g. insurance companies, developers) for information about the status of water lines at various sites or to report problems. There is also a need to have information about the assets themselves, such as pipe size and material or valve type and size, especially during emergencies relating to water pipeline breaks, damage to hydrants, scheduled and unscheduled shutdowns of water pipelines, etc...

Most of the water system map information is on hard copy drawings, which are used as the primary reference source for location and detailed information on the water system. These maps are still being updated on paper, but there is a backlog at this time. A schematic of the water system is housed in an AutoCAD drawing that was done by Murray Smith. GPS data for valves and hydrants was collected in 1995, but the data has not been updated. The data has been loaded into GIS and there has been an effort to "connect the dots" with pipes. Meters were hand digitized and it appears these points may have IDs that correspond to Springbrook water billing system. Finally, there is the Hansen system, which TWSA has recently begun to implement. The primary Hansen module that is being used is the work order system. Valves and hydrants are also being put into Hansen.

MAGIC is used regularly by staff to locate addresses and intersections, as well as see aerial photos and property information. They can use the intersection grids to view scanned schematics of the water system.

USER REQUIREMENTS

There is a high level of frustration regarding access to information about the water system, since so little of the information is automated and readily available. Paper records are cumbersome and data maintenance is difficult. There is concern that Hansen is not integrated with GIS and that the Hansen data may not fulfill the needs for a complete and accurate source of water system information. Previous

automation efforts have been piecemeal and have not been maintained. Essentially, the water system records are a disparate set of records in various methods of storage and various states of accuracy and completeness. This creates a large gap between expressed user needs and the possibility of achieving them.

Furthermore, there is a need to have locations for all water meters for the purpose of meter reading, repairs, and replacements. Not all meters are located in GIS at this time. It is also important that new and replacement meters that are sold via water billing are entered in Hansen and ultimately GIS for data management and maintenance purposes.

User Needs

The primary use of GIS right now by TWSA staff is via MAGIC. There are many needs for added data content and access via a mapping interface. All business areas in TWSA have a need for complete, accurate, and integrated information about the water system.

- Access to a complete source of water system information that includes detailed attributes about all water assets, including: pipes, valves, hydrants, service lines, meters, pump stations, reservoirs, and other appurtenances. (A detailed list from John Goodrich supplements this description; it should not be considered a final design, but rather a solid wish list that can assist in a data design process)
- Hansen data should be connected to GIS features and should be available via a GIS interface
- Springbrook data should be connected to GIS features and should be available via a GIS interface, notably meters
- Water system data overall should be accessible via GIS
- Ideally, one foot accuracy for location of assets
- The hard copy map set should be replaced by a maintained, digital data set that has IDs connecting to Hansen
- The as-built drawings should remain accessible as geo-referenced, scanned sheets; every detail does not have to be digitized.
- Hansen and Springbrook information must be consistent. For example, the current business process related to change-outs of water meters sometimes results in information being changed in Springbrook, but not getting back into Hansen
- Hansen, Springbrook, and GIS must work in an integrated and connected manner for water system data maintenance
- Field access to water system data, based on address—type in an address and be able to see all information related to the service at that property
- Use existing sources, as much as possible, to build an integrated water system data source
- Need to define short term action for map updates and data cleanup that will move the City forward for the long term data set and data management
- Boundary maps are very important, since the district boundary is not the City limits; Need all service boundaries, such as water, sewer, sanitary, since they don't all match
- Service calls need to be coordinated and managed; they should be viewable in GIS
- Ability to trace what valves need to be shut off in an emergency

- A GIS network, based on the most current and accurate representation of the water system, that can support modeling for service planning, fire flow etc.

Problems and Issues

Most of the issues surrounding the water system and GIS involve data management; data content and completeness; and data connections between systems. The expectations for access to high quality, integrated, and complete data are very high, but the business systems and roles are not there to support the expectations. Some of the priority problems and issues include:

- Lack of feature definition and connection between Hansen and GIS
- No thoughtful GIS/Hansen design work—Hansen data may not be useable in GIS to the extent desired
- Disparity between desire for information from Hansen and Hansen content. For example, pipe ratings are needed for long range planning but this information is not stored in Hansen.
- There are many data sources, including paper, digital, GPS points, AutoCAD. Most are not maintained and they are not connected in any way.
- Some source data has been discarded accidentally over time
- The hard copy maps are the best source of system data, but they are behind in maintenance. There was a lapse in data management when the digital mapping approach was originally considered but was not implemented.
- Shape files have been created for valves, hydrants, sampling stations, etc. but they are not maintained on a regular basis and there is no business process to support this maintenance. This will not work over the long term.
- People are dutifully entering data into Hansen, but they are frustrated in knowing that the data is not being used beyond record keeping and work orders.
- There is a short term desire to improve data with some existing funds; it is not clear where the money will be spent to the greatest advantage, considering long term goals and needs.
- Meters are added into Springbrook when a new service is installed. At that time, the information is also entered into Hansen. Maintenance of the data between the systems is not coordinated through a formal work flow... The good news is that the meter-id is the same in both systems.
- A map location for every meter in the service area is not available. Although the field meter reading staff are very knowledgeable of all the locations, they are not located on a map (institutional knowledge must be captured).
- Service calls are taken in Utility Billing and also in Public Works. This creates a disconnect in data maintenance once the service call has been completed.
- The meter “bible” used in billing is a single hard copy. Although most of this information is replicable in case the book is lost or damaged, it is not replicated or backed-up in any way (there is some valuable information on which meters serve which properties in this document).

Opportunities

TWSA has some opportunities to build the water system information source that will meet their high expectations. They are conducting the work that will support data maintenance and the staff is dedicated

to improving the data. The maintenance of the hard copy maps has been quite diligent. The opportunities are presented because things are not too far along. There are many existing data sources that can be optimized in building the new database. Existing systems, such as Hansen and Springbrook, can assist in data management and storage; however, they also present design challenges for integration with GIS and mapping. Some of the opportunities we saw in the workshops are:

- There are good, yet disparate sources for building the complete water system data source. The GPS data is a great start for the valve and hydrant location. Even though changes have happened over time, it's a good source for the location of those valves and hydrants that still exist in the field. The hard copy maps will be an excellent source of pipe data and updates to valve and hydrant locations.
- There are some existing funds to be spent on data for the water system. This should be evaluated carefully, in light of data and system issues. This money should not be wasted on solving the wrong problem.
- There is opportunity to create a solid design for the water model in GIS
- Hansen data needs to be compared with the desired data expressed by staff and managers. Is the data getting in, as needed?
- The consistent meter-id between Springbrook, Hansen, and GIS provides opportunities for data transfer and checking.
- Have field meter reader staff geo-locate meters (especially those in obscure locations) using a mapping-grade GPS.
- Create a digital scan of the meter "bible" in case of loss or damage.

Data and Design Impacts

As this project moves forward into recommendations for solutions and action, there are several areas of data and design impact that must be looked at. So far, Hansen is the selected data management system for information about the water system maintenance and work orders. If TWSA commits to a full Hansen implementation, it must be thoughtfully integrated with GIS to optimize its use in mapping and analysis. Details of the data and design impacts have been mentioned in the previous sections, but they are summarized here together:

- Spatial data management—Currently, there is a mix of people and divisions involved in GIS, hard copy mapping, Hansen data entry, and other spatial data management tasks for the water system data. A data management plan and process are needed. The data maintenance needs to be more streamlined and coordinated. Roles and expectations must be defined.
- Data Content—it is not clear if the data is really available to support the expressed needs of staff. The data assessment is vital to the success of building the water system information source.
- Hansen—Design in Hansen for water data will be another focus of the data assessment
- Springbrook—Integration opportunities, as well as data transfer and checking between Hansen, Springbrook, and GIS must be considered.
- A GIS data model and structure is needed for the water system.

BUSINESS FLOW

The business processes and data are not meeting staff needs for the maintenance, management, and planning of the water system. The lack of access to Hansen data is frustrating for the staff. The best

source for data in the field is still the hard copy maps, which are out of date. Existing automated data sources are not connected or optimized. Finally, the level of desired data content expressed by staff may not exist in any data sources at the City. There is a lot of work to be done in assessing the existing data and systems, as well as the business processes that update and use the information. An analysis of the content and design in Hansen is the first key in determining what changes are needed, and what it will take to have Hansen meet the data management needs, while providing usable input for use in GIS. The second key will be defining good business processes to support data maintenance at the level of expectation for GIS products, services, and capabilities.

The following diagrams show the existing flows and problem areas for spatial data that supports water system business areas. There are a few key problem areas where the process breaks down, as labeled on the diagrams.

Figure 2-1 shows a high level view of business flow for the water system. There are several important problem areas.

- The first involves the wide ranging set of data sources. There are many sources, they are disconnected, and they are underutilized. They represent the potential to build a high quality data source, but they are not being optimized.
- The data management issues for the water system are clear in the diagram. Hansen, Springbrook, and the hard copy maps are all part of the current data entry workflow. Even these three components are not working together at this time. For example, a new service gets input to Springbrook and Hansen, but once the service is installed, the asset information does not get back to Hansen.
- It is not clear at this time whether the required data is being stored in Hansen. The maintenance of pipe data is vital to the water system, yet it appears to be missing from the Hansen design.
- It does appear that the ID numbers between Hansen, Springbrook, and GIS are consistent. This needs to be verified. There is no automated interoperability between these systems, even with the existence of consistent IDs.
- The GIS shape files were created to try and make use of the Hansen and other mapping data in GIS. However, this dataset needs to be designed and integrated properly with other data sources and, possibly, stored as a network that can support the needs for tracing and modeling.

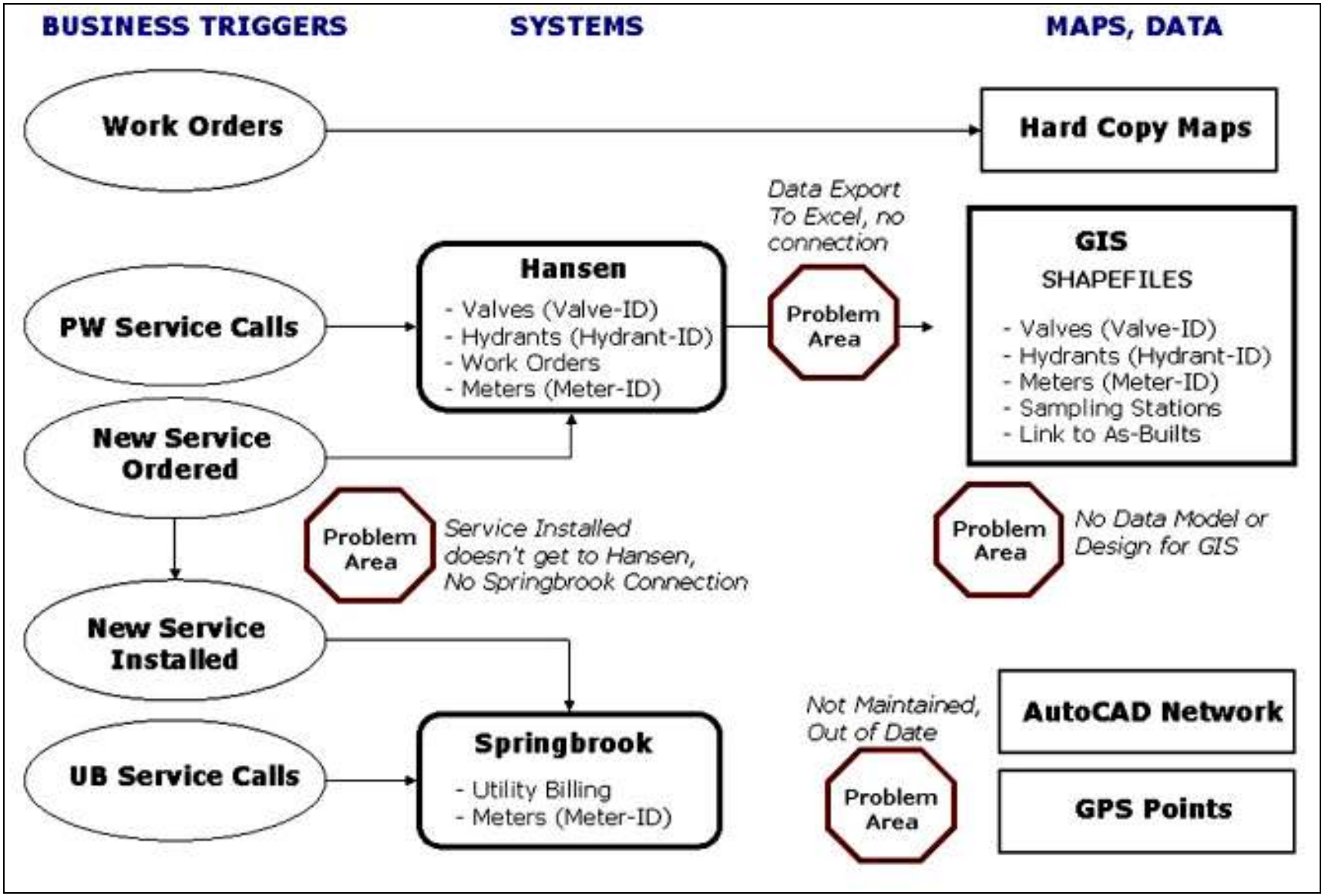

Figure 2-1. Water System Business Flow—Existing Process

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for the Water System in Tigard, based on expressed common needs and overall GIS design implications. This section summarizes the highest priorities for GIS to support water system maintenance, management, and planning in the City of Tigard, based on expressed common needs and overall system design implications. These priorities will guide the recommendations for this project, as well as the approach for the data assessment and high level GIS design work to follow.

Staff expressed the desire for access to a complete data source for water system information. This includes both location of assets, as well as detailed attributes about those assets. This information would be available in the office and in the field and would support daily operations as well as long range planning. The water system information would be available, along with other City data, from an easy to use mapping interface that supported viewing, research, and map-making. The existing hard copy maps would be replaced by a GIS data set had connections with Hansen and, possibly, Springbrook.

At this time, TWSA has acknowledged that there is a lot of work to do in the area of data development and design when working towards a high quality data set of Tigard's water system. There are many resources that can be used in building the system and these existing resources should be optimized before money is spent re-doing existing work. The GPS points, hard copy maps, and existing Hansen data are all part of the puzzle. Investigation of Hansen's content and design should be done within the data assessment phase of this project. It is important to discover the gaps in Hansen content, as compared with expectations for using the data.

The technical keys to success in the long term are good Hansen design, a good data model and design for GIS, and a level of integration and/or cross-checking between Hansen, Springbrook, and GIS. The level of integration will depend on the needs and the value to the organization. True system integration with GIS and other systems can be complex and expensive. The organizational key to success is systematic maintenance with roles, responsibilities, and a supporting set of activities and systems. Data management is crucial as well.

CHAPTER 3.
STORM AND SANITARY SYSTEMS

OVERVIEW

The City of Tigard Public Works Department manages and maintains storm water conveyance and the sanitary sewer system within the City. Historically, the City maintained index cards that roughly depicted the location of pipes, outfalls, manholes, and other features related to these two systems. Over the past fifteen years, the City has made several efforts to have these systems digitized and accessible via MAGIC (to variable degrees of success). Furthermore, the City has been using the Hansen storm and sewer modules to enter and track asset information and produce work orders for these systems. To a limited extent, these systems are also mapped in CAD drawings and as-built maps stored at the City.

The City uses a television inspection system (TVI) to assess the conditions of pipes. Inspection reports result in critical ratings of pipes. The ratings are important for the regular maintenance and replacement of pipes.

There has been a considerable effort in the development of a sewer network in GIS. Generally, there is a high level of confidence that this layer is about 98% complete and reliable. The layer is currently accessed using MAGIC. However, similar to other business areas that rely on both GIS and Hansen, there is a fundamental disconnect between the two systems for sewer. At this time, it is not easy to connect the Hansen asset data to the GIS because poor coordination between the Hansen records and GIS features.

The storm system lacks a reliable GIS network. Portions of the network are available in MAGIC, but its representation is considered "rough." Consequently, the connection to Hansen is non-existent.

A reoccurring theme with storm, sewer, and water is 1.) The lack of a reliable connection between GIS and Hansen, and 2.) A general lack of confidence that Hansen data is managed properly. In the case of storm and sewer, Public Works staff generally assumes they cannot trust that pipe ages and critical ratings are reliably and accurately entered into Hansen. In addition, the Hansen system for finding a storm or sewer feature is a street address, which is an awkward method as these features are often in the street rather than on a addressed property. Furthermore, the depictions of these utilities in MAGIC are not well composed.

USER REQUIREMENTS

There is a high level of frustration regarding access to information about the storm and sewer systems, since so little of the information is automated and readily available. Arguably, the storm, sewer, and water systems are the three most critical infrastructures in the City. User requirements demand a high level of reliability in mapping these assets and logging their most basic information, mostly for the purpose of maintenance and creating work orders. To date, this has proceeded with variable results.

User Needs

Basic requirements for both storm and sewer are very straightforward. Public Works needs to know where the pipes, catch basins, manholes, outfalls, inlets, and ditches are. Basic attribute information must include materials, diameters, installation years, and critical ratings based on TVI. Work orders must be able to link to either an individual feature, or a group of features. It is important to be able to view a history of work orders related to a particular feature, and to be able to plan and schedule repairs, maintenance, and replacements. Ideally, the mapped features, their attributes, and associated work orders could be viewed both graphically (on a map) and via tabular data forms (i.e. Hansen) without jumping between Hansen and MAGIC.

- Select a particular asset (pipe, catch basin, etc.) in Hansen and be able to review current and reliable attribute information. Be able to "pop-up" a map of the feature with a simple button click.
- Click on a feature in the GIS and quickly display the Hansen attributes
- Query a subset of features in Hansen (e.g. installation year or a particular rating) and create a quick map of their locations
- Select a subset of features in the GIS and quickly list their Hansen attributes
- Select a feature in either Hansen or the GIS and view a work order history
- Be able to graphically group features for creating a work order via the GIS
- Use the Hansen work order tool via Hansen or the GIS
- Use a GIS map interface to draw utilities, similar to MAGIC but with enhanced symbols, colors, and annotations.
- Make a "5 minute map" using a streamlined GIS interface with custom comments, labels, and leaders to point out features.
- Use Hansen and GIS to conduct long range planning analysis for critical assets
- Have the option of entering and editing data in Hansen via a mapping (GIS) interface

Problems and Issues

Although sewer is in GIS, the system is not synchronized with Hansen. Storm is neither complete as a GIS layer, nor coordinated with Hansen. There is staff unofficially in charge in maintaining the Hansen records, but the lack of procedures and protocols for doing this has negatively impacted the data integrity. Stewardship of the GIS layers is performed ad hoc. The results are a basic lack of confidence in the Hansen data, and the inability to make simple maps of both systems that code features with Hansen attributes.

- Lack of feature definition and connection between Hansen and GIS, including no feature-level synchronization and a reliable feature ID system to link the two systems
- No documented data model for geographically storing the utility layers
- Storm system is not in GIS and is a difficult network construct to build
- Lack of documented data management procedures for both Hansen and GIS resulting in unreliable results (especially for year built and rating data in Hansen)
- Ill-defined governance of the Hansen system and GIS
- Hansen was designed to search storm and sewer features using an address which is awkward (often features do not easily relate to a discrete street address)
- The process of refreshing new storm or sewer data to MAGIC is not known, if it exists
- MAGIC does not offer good cartographic representation of utilities, nor does it allow for quick and attractive map production

Opportunities

The City has some opportunities to build Hansen and GIS to meet their storm and sewer business needs. Although the obvious opportunities involve a more seamless connection of the two systems, the real

opportunities lie in data stewardship, data management, and taking advantage of GIS data models that are designed for utilities.

- Inventory/re-inventory of storm could include a field data collection effort using high-accuracy GPS to locate features and invert elevations
- A Geodatabase model for storm can include closed (pipe) conveyance, culverts, and ditching
- Use knowledgeable staff to clean-up existing Hansen data and creation of a feature ID system
- Create data management procedures and implement tools that interoperate with both GIS and Hansen, such as GeoAdminstrator
- Allowing users to search a feature using a GIS interface could bypass the unreliable method of searching a feature by address in Hansen
- Identify data management stewards and make maintenance of Hansen and the GIS features as a part of their job description. Offer ArcEditor training to appropriate staff
- Take advantage of superior cartography tools that will be in a prospective data viewer replacement of MAGIC
- Update and enhancement of Hansen data to include required elements for planning and analysis; this might include critical rating, inspection dates, date of install etc.

Data and Design Impacts

As this project moves forward into recommendations for solutions and action, there are several areas of data and design impact that must be looked at. So far, Hansen is the selected data management system for information about the storm and sewer systems maintenance and work orders. If the City commits to a full Hansen implementation, it must be 1.) Methodically managing the Hansen database for each and every feature, and 2.) Thoughtfully integrating Hansen with GIS to optimize its use in mapping and analysis. Following are the detailed data and design impacts:

- Spatial Data Development—there must be a coordinated effort to assess the sewer system for completeness, and create the storm system from scratch using all available existing information (surveys, as-built drawings, CAD drawings) and field inventory, where required
- Spatial Data Management—Currently, there is a mix of people involved in GIS, hard copy mapping, Hansen data entry, and other spatial data management tasks for storm and sewer. A data management plan and process are needed. The plan may start with a Geodatabase model that best suites the City's needs, as well as the connection to Hansen. The data maintenance procedures should be streamlined and coordinated. Roles and expectations must be defined.
- Data Content—it is not clear if the data is really available to support the expressed needs of staff. It appears installation dates and ratings are not consistently entered. The data assessment is vital to the success of building the storm and sewer systems information source.
- Data Sharing—it is not known how and when storm and sewer data are refreshed so it is available to others via ArcSDE and to MAGIC
- GeoAdministrator, if used properly as an extension to ArcMap, allows for a single point of data entry for new features (rather than Hansen and GIS separately). The tool also allows for synchronization of the Hansen attribute fields over the GIS attribute table. This tool affords many potential benefits.

BUSINESS FLOW

The business processes and data are not meeting staff needs for the maintenance, management, and planning of the storm and sewer systems. At this time, there are unofficially designated people to manage Hansen and build GIS features for MAGIC. There has been enough work and investment in Hansen and the GIS networks that it is not worth starting over with replacement systems. However, the business flow contains several problems that are reflected in the problems and issues with effectively using storm and sewer data.

The following diagram shows a high-level view of the existing flows and problem areas for spatial data that supports the storm and sewer systems business areas. There are a few key problem areas where the process breaks down, as labeled on the diagrams and noted below:

- The first is the trigger that causes an update to Hansen does not automatically trigger an update to the GIS (particularly problematic when adding new features)
- Procedures for performing a Hansen update do not exist, resulting in data entry inconsistencies
- The updating of the GIS network does not have a documented process
- When a problem to one of the systems is reported, the responding person first goes to MAGIC to locate the feature or features, and then goes to Hansen to look up feature to view its data and create the work order (inefficiency)
- The address retrieval method in Hansen is difficult to use because addresses do not always directly relate to a feature (could be one of several potential address—very inefficient geographic search method).

Not depicted in the diagram are several nuances to Hansen that make data entry, data management, and creation of work orders difficult. Notably, there are a few feature types that are not in the "out-of-box" pull down list. Also, it is difficult to group features for a work order applied to a geographic region rather than to a discrete feature.

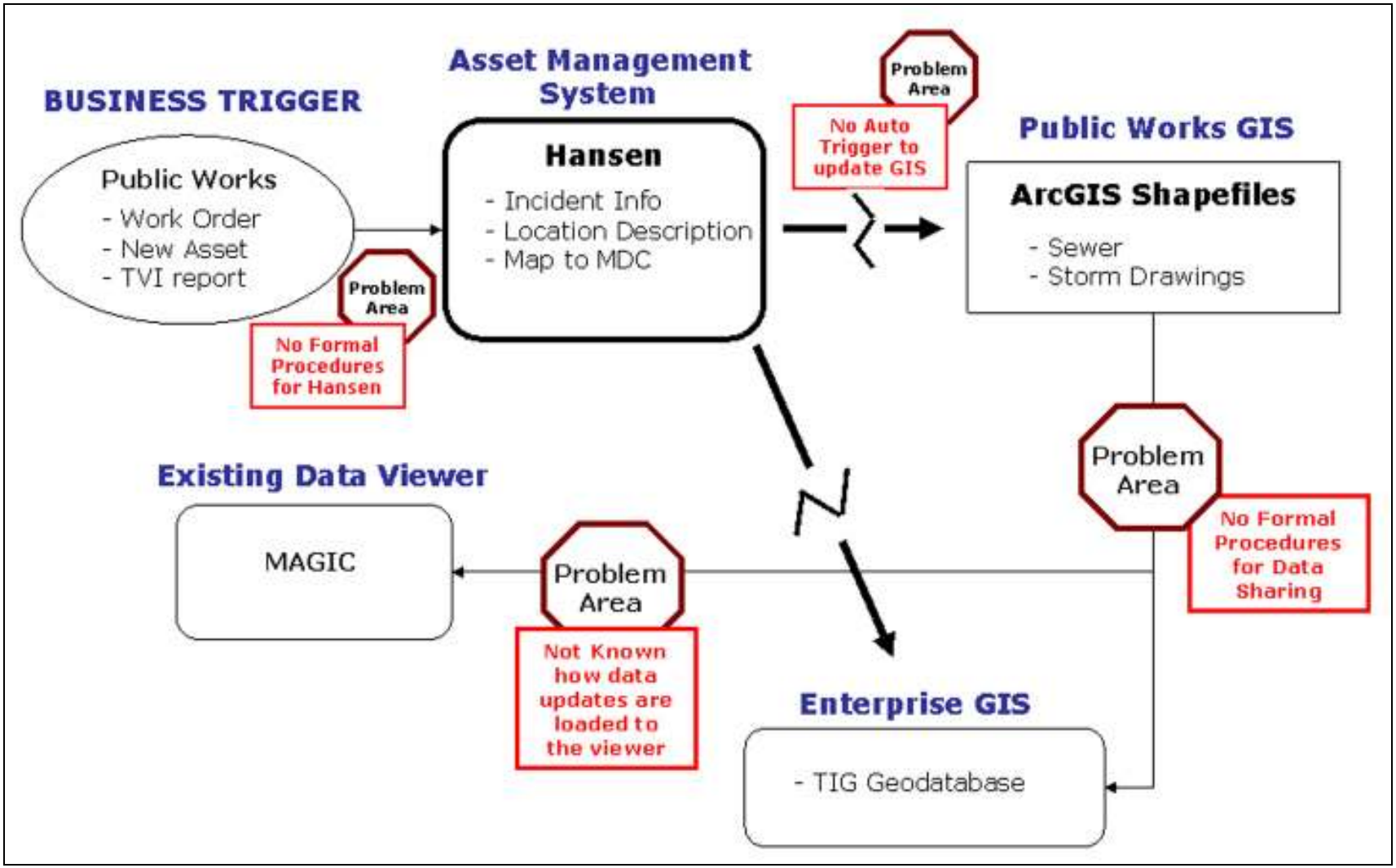

Figure 3-1. Storm and Sewer Facilities—Existing Process

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for the Storm and Sewer Systems in Tigard, based on expressed common needs and overall GIS design implications.

First, Public Works must designate data stewards for both Hansen and the GIS. Ideally, the GIS analyst would initiate a new feature first in the GIS and simultaneously populate a new associated record in Hansen. The Hansen data technicians for either storm or sewer would then add attribute data, notifications of changes to affected staff, and develop all work orders.

The GIS data steward and Hansen administrator should work together to define a data model and document data development and data management procedures. This should be followed by an effort to clean up data already in Hansen and GIS to be complete and fully populated with important attribute data.

Once a data model and data management procedures are in place, efficiency tools should be identified to make things easier. Hansen's GeoAdministrator has been mentioned and may be a tool to look at it is also important to establish a protocol for refreshing the ArcSDE Geodatabase (TIG instance) with updated versions of these layers once they are modified.

Finally, requirements for a prospective new data viewer should include a needs assessment of the public works staff related specifically to utility management and mapping.

CHAPTER 4.
STREET SYSTEM

OVERVIEW

The business related to the street system includes a wide range of activities, but is mostly focused on the maintenance and preservation of the street City's street network. The City is responsible for the maintenance of 143 miles of paved streets, maintenance of street and traffic signs, installation and maintenance of guardrails and barricades, crack sealing and patching street surfaces, maintenance of off-street bicycle paths and installation, and marking.

Data related to the street system is extensive, including the street centerline layer, pavement management data, functional classification, pedestrian, bicycle, routes, street lights, locations of traffic signals, transportation projects, sanding priorities, maintenance jurisdictions, bridges, bus stops, and bus lines. This data is either maintained by the City or obtained through other jurisdictions. In addition, two major highways, Hwy 99W and Hwy 217 crisscross the City. These highways are owned and operated by the ODOT.

Public Works uses the Hansen work order module for street maintenance. Hansen is also used to store information about signs. The street segment network is maintained in Community Development as a shape file. The Pavement Management function is handled by the Capital Construction and Transportation Division (CC&T), which is in Community Development. Pavement Assessment for maintenance is done by Public Works. Pavement Management is currently being converted to Hansen. Parks streets are not part of the City's street network, either in Hansen or the GIS.

USER REQUIREMENTS

The work involving the maintenance, management, and planning of the City's street system is distributed between Public Works and CC&T. The street network is maintained by a planner in Community Development. Washington County maintains the signals through an inter-governmental agreement (IGA) with the City. Requirements for the users are complicated by the multiple systems, departments, and agencies involved with the City's street system.

User Needs

There has been limited use of GIS in Public Works and the Capital Construction and Transportation Division and Development Engineering Division within Community Development to support the street system maintenance, management, and planning. City staff uses MAGIC for basic mapping and analysis purposes. The Street Network shape file has limited information that has been entered by Community Development. Hansen is the primary system used by Public Works and Community Development (the Engineering Divisions) for maintaining street system information, but there are no solid connections to GIS for data sharing or use in the GIS environment. The following outlines user needs that were expressed in the workshop:

- Integrate Hansen street data management, pavement management, and work orders with the GIS. Consider what is available in Hansen and how to provide means to display and search using GIS.
- Have access to user mapping and research tools that are as good as, or better, than existing MAGIC capabilities

- The ability to report annual street mileage to ODOT
- The ability to use Hansen data for street system planning
- Use GIS for forecasting and visualization in street system planning
- Access to CIP information, both present and historic
- Maintain a complete sidewalk inventory
- Maintain an inventory of public and private streets
- Maintain locations of traffic calming devices, embedded crosswalks, and bridges
- Maintain a complete bike route map
- Coordinate pavement management and street rating efforts between Public Works and the Engineering Divisions within Community Development
- Ability to map sign locations
- Ability to pull all street system data together in a mapping environment that can be accessed by entering a location (addresses or cross street)
- Ability to view other City facilities and data in conjunction with street data
- Ability to identify right of way.
- Parks would like to track roads within Parks—how to tie this to existing network?

Problems and Issues

Most of the issues surrounding the street system and GIS involve data management, data connections, and data content. The Street ID connection between Hansen for streets and GIS exists, but is not coordinated under a reliable documented procedure. It is not clear how Hansen pavement segments will connect with GIS, if at all. There are also coordination issues in the flow of data maintenance among different departments and divisions. These include:

- Lack of data management protocols and procedures - there is no automated system for synchronizing Hansen and the City's street centerline network, nor documentation for the manual coordination of the two systems.
- The City's street centerline is maintained in Community Development. This is a maintenance process that should be re-evaluated, since CD has no role in the City's street network business, outside of addresses. They may continue to play a role, but it seems that it does not make sense to have this data housed in this department. The appropriate staff should consider reviewing this data layer's maintenance responsibility.
- Some data is maintained, apparently, directly on the street network in GIS—how does this tie to business and to asset management in Hansen?
- Lack of design of street network purpose and content in GIS—there is no definition of its purpose, thus no thoughtful schema of the data model
- Limited access to street system data using GIS—the street layer is maintained in a flat file (shape file) with no enterprise access
- Concerns about Hansen design for street network and making sure that ties with street names in the permit system for addressing

- Keeping the pavement management and street maintenance efforts coordinated at a data level, particularly when it comes to Hansen, but also with GIS. This is a red flag as the pavement data is being converted to Hansen.
- Hansen system is underutilized for street system management
- Lack of Parks streets in street network and database
- Signal data comes from the Engineering Divisions within Community Development and is maintained by the County. How to tie this into a maintenance process in Hansen and GIS?
- Lack of confidence in the data - stakeholders who should be accessing Hansen data via a GIS does not have confidence that the systems (the street segments) are logically coordinated; therefore, they are not likely to use it even if available.

Opportunities

The needs for GIS in Street System maintenance, management, and planning present some good opportunities to improve existing business processes related to the street system, as well as to provide additional new capabilities for improving management of the street system. There are some crucial windows that are currently available with the Pavement Management project:

- A focused design session with stakeholders for the street network model—what do you want to map on the roads? What are the best network models and referencing systems to accomplish this? Tie this in with pavement management design efforts ASAP.
- Carefully assess the design plan for pavement management in Hansen and ensure the required links to the GIS street segments are there
- Develop a defined data management and maintenance system for Hansen street segments and GIS
- Use the GIS design aspect of this project as an opportunity to do the high level design for a GIS street network for Tigard
- Decide what data from Hansen can be used in GIS and make sure the design and maintenance support that
- Assess how signs and other point locations should best be stored in Hansen to support mapping and spatial queries
- Parks is about to move to Hansen for asset management—this is an ideal opportunity to evaluate how this can fit with existing street and asset data, as well as GIS

Data and Design Impacts

As this project moves forward into recommendations for solutions and action, there are several areas of data and design impact that need to be addressed. Since Hansen is the selected data management system for information about streets and for maintenance and work orders, it must be thoughtfully integrated with GIS to optimize its use in mapping and analysis. Most of these have been mentioned in the previous sections, but they are summarized here together:

- Spatial data management—currently, there is a mix of people and divisions involved in GIS and spatial data management for the street system data. A data management plan and process are needed. The data maintenance needs to be more streamlined and coordinated.

- Hansen—the ways in which the network and point data have been defined and stored is key to how much or how little GIS can support mapping, management, viewing, and analysis of this data. The Data Assessment will focus on streets as a high priority.
- The GIS Street network needs to be designed to support people's expectations. It also needs good maintenance that is tied with Hansen for pavement management and for the street system. The current street shape file provides simple mapping capabilities; however in order to benefit multiple business systems the data structure needs to be redesigned...

BUSINESS FLOW

The business processes for the street system maintenance, management, and planning are not supporting the user needs. The lack of access to Hansen data is frustrating for the staff. GIS provides an opportunity to integrate and overlay information from many sources, but this is not happening. There are breakdowns in data flow that design work and data management efforts might be able to repair. However, this is all dependent on analysis of the content and design in Hansen and a determination of how serious the data content and design problems really are. The second key area will be defining good business processes to support data maintenance at the level of expectation for GIS products, services, and capabilities.

The following diagrams show the existing flows and problem areas for spatial data that supports street system business areas. There are a few key problem areas where the process breaks down, as labeled on the diagrams.

Figure 4-1 shows a high level view of business flow for the street system. There are several important problem areas.

- The first involves design of the street network(s) in Hansen and GIS. The integration of GIS and Hansen is not possible without very conscious attention to the street network design and maintenance for pavement, street maintenance, and GIS. The Street-ID and the street network construction are equally important.
- The second is the transfer of signal data from Washington County for use in GIS. This process needs to be defined and streamlined.
- The data management issues for the street system are clear in the diagram. There are several divisions involved within the City and an outside agency. There are multiple systems and Hansen modules involved as well. If data management is not addressed, the desire to have GIS access to the data will never be realized.
- Finally, the location of the GIS maintenance role should be revisited. It is impossible to maintain an effective and complete street network, particularly when considering the Hansen implications, outside the business area. This role is needed in Public Works.

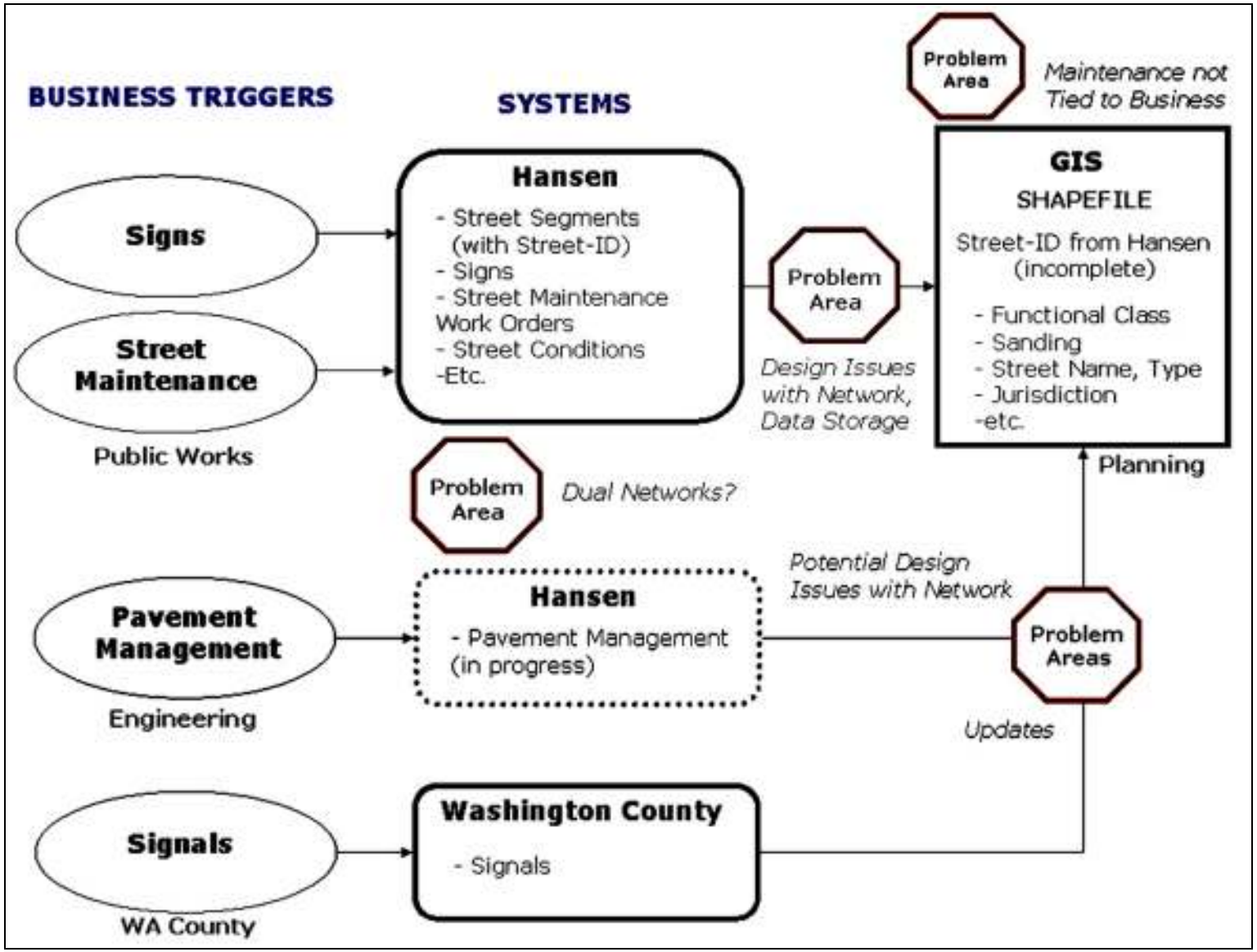

Figure 4-1. Street System Business Flow—Existing

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for GIS to support street system maintenance, management, and planning in the City of Tigard, based on expressed common needs and overall system design implications. These priorities will guide the recommendations for this project, as well as the approach for the data assessment and high level GIS design work to follow.

The highest priority expressed by the staff was the need to have access to all street system data through a mapping interface. Integration with Hansen, at least making use of Hansen data, is required to make this a reality. No amount of data entry into Hansen will result in GIS access and capabilities without good design within Hansen and between Hansen and GIS. Because the Hansen system has been in development for a number of years, the data assessment will focus on how the data is designed right now and how that fits with GIS requirements. The data assessment will also look at the GIS shape file and how that might be better designed and maintained regarding Hansen and also in the Geodatabase environment. Finally, the link to the street names in Hansen, GIS, and the permit system will be evaluated. GIS is the means to optimize the use of existing and future street system data. Data management and design, combined with good business processes, will be the key to a successful implementation.

CHAPTER 5.
FACILITIES AND ASSETS

OVERVIEW

Facilities relate to city-owned assets that serve the business functions of the City of Tigard, as well as buildings, properties, and a wide variety of physical assets that serve the general public. A facility can be many different things, but generally represents a physical asset owned and operated by the City. Examples include streets, storm conveyance structures, sanitary sewer, the water system, parkland, buildings, and storage structures to name a few. A facility such as a park includes several assets that are inventoried and maintained by the City, such as bollards, trees, roads, restrooms, playground equipment, and water service lines. As noted by this single example, the management of facilities at a City the size of Tigard involves several staff and capital resources.

As a business area, facilities management involves all City departments and takes part in other business areas. Programs within the City that play a large part in facility planning and management include the following:

- The Community Investment Program (CIP)—The CIP provides a 5-year plan for major capital expenditures. The program developed under the direction of the Community Development Director and is largely operated by the Engineering Department and Public Works. It is annually approved by the City Council.
- Risk Management—The City's Risk Manager is in the City's Administration Department. The primary purpose of the Risk Manager is to assess the potential for injury and threats to city assets, finances, and services. In instances of claims, the City's Risk Manager needs very detailed information about the location of subject City facilities and assets. Risk management is critical in procuring liability insurance coverage for the City.
- Building Maintenance—Building maintenance personnel are managed by the Facilities Coordinator. Buildings owned by the City must be regularly inspected and maintained. Maintenance includes bio-chem replacements, sprinkler testing, and duct cleaning, to name a few.
- Parks Department—Specifically noted because the parks department operates mostly independently from other departments and provides very important and high profile recreational facilities to the citizens of Tigard. Although the City's Administration department has a vested interest in a complete inventory of park assets, it is the Park Department itself that maintains all park facilities.
- Disaster Management—One of many programs that require facilities data for emergency response, especially at the emergency operations center. This program is covered in its own user requirements document.

Because streets, water, storm, and sewer are covered in other user requirement documents, this document will focus on other city-owned facilities, primary buildings, parks, and related assets.

USER REQUIREMENTS

The geospatial requirements of users working with city-owned facilities and assets involve the mapped location of properties and geographic features. In the case of building maintenance and parks, more detailed drawings (building footprints and layouts or design drawings) are often required.

User Needs

The following summarizes the user needs expressed at the workshops:

The Community Investment Program - Staff planning for new or replacement facilities and assets need to have quick access to base maps of the City and its existing assets. Data on facilities and assets related to age, condition, and replacement/repair values are particularly helpful.

Risk Management—needs the accurate location of all city properties, facilities, and field assets on a map. This would preferably include the layout of assets on city-owned properties, such as parking lots, trees, lights, etc. The maps must be able to depict the precise location of facilities relative to publicly owned property, primarily the street right-of-way. Risk needs to present public properties, facilities, and assets relative to potential hazards on a map (often an aerial photo map) to insurance carriers and for litigation. Risk needs to link risk data to particular assets. The Financial & Information Services Department also requires asset inventories to prepare GASB34 depreciation schedules.

Building Maintenance—needs maps locating all city-owned buildings, including structures that are not addressed. Ideally, building maintenance would have easy access to building layout drawings including as-built plumbing, electrical, and HVAC systems. They would also like a maintenance scheduling system that can be tied to buildings, as well as a method of tracking warranties on products installed in city-owned buildings.

Parks Department—requires detailed maps of each park property. Each map would include the location of all assets within the park, notably roads, water/sewer lines, storm features, parking lots, restrooms, shelters, lights, hazard trees, heritage trees, and maintenance facilities. Parks needs to maintain facility and asset data related to installation dates and condition.

Problems and Issues

The greatest problem to managing facilities and assets owned by the City is incomplete map coverage. Detailed drawings of buildings and asset locations on City property are available for some facilities, but not for all.

- Many city-owned facilities and assets are simply not located and mapped.
- The Administration Department tracks facilities by address; however, many facilities and assets do not have an address.
- Building maintenance tracks work orders in a spreadsheet system that does not tie to the geographic features nor automates scheduled maintenance.
- Building floor plans are not easily accessible to building maintenance staff.
- Projects in the CIP are not consistently mapped.
- Similar to Public Works and Engineering, Parks must track its own assets for maintenance and management; however they have just been introduced to Hansen and have not yet built an asset database.
- There is a fundamental lack of data to support asset replacement and repair opportunities.

Opportunities

Because the geospatial data requirements for managing facilities and assets overlap with so many other business areas, opportunities are abundant.

- The benefits of a new data viewer will equally serve the needs of staff planning for and managing facilities and assets.
- Parks can collaborate with Engineering and Public Works to create a good design for managing their asset data (using both Hansen and GIS) and to share Hansen data management responsibilities
- Any field inventory efforts should be coordinated with facility and asset managers, as well as needs of risk management. There may be opportunities to locate high priority assets while in the field.
- Creating a separate GIS layer for projects proposed in the CIP would greatly help facility planners.
- The mapping of critical facilities would directly benefit emergency responders as well as the disaster management team and emergency operations center.
- Efforts by Tualatin Valley Fire & Rescue to map building footprints and hazardous material locations may benefit the City's facility and risk managers.
- All staff working with facilities and assets will benefit from GIS data production and integration with Hansen, notably the streets, signals, signs, and utility layers.
- Facilities and assets can be located using X/Y rather than an address (resolves the "must have an address" problem).

Data and Design Impacts

Efforts to build and enhance GIS layers for other business areas should consider the needs of facility managers, facility planners, and risk management. Therefore, there may be design considerations when developing a Geodatabase and relationships to Hansen.

- Spatial data development—there should be a focused effort to identify what facilities are a priority for mapping. Not everything can be located and mapped. The priority list should consider the needs of all business areas. All projects in the CIP should be mapped, even if a point of a proximal location.
- Spatial data models—any effort to model a layer in the GIS should include park facilities (the City's street layer should include park roads as well).
- Spatial data accuracy and precision—any inventory and mapping of facilities and assets should be controlled using the city's base map of aerial photography and the cadastre. The located asset should be accurate to the property it actually lies on.
- Hansen—many facilities and assets owned and managed by the City can be stored in a Hansen module already being used. Synchronization with GIS will offer several benefits to facility planners and managers.
- Spatial data management—facility and asset managers should claim responsibility for managing Hansen data fields relevant to their work. Data stewardship is key to long term success for spatial data management

BUSINESS FLOW

The business processes for facilities vary significantly based on the business need. Triggers would include the following:

- The Community Investment Program—The CIP is updated annually and occurs when budgeting for the forthcoming fiscal year. At this time, planners review projects in the pipeline and establish priorities for the upcoming year. The use of GIS and maps showing existing infrastructure and CIP project locations would ensue.
- Risk Management—Risk requires the use of facility and asset data when a.) A claim is filed against the City, and b.) When renewing/updating insurance policies.
- Building Maintenance—At the time a work order is issued for a routine repair or maintenance procedure, the facility manager may require data about the facility, such as system layouts and previous work orders.
- Parks Department—The Park Supervisor requires park maps and asset information when a.) Planning for and locating a new park facility, b.) Maintaining or repairing existing park facilities and assets, and c.) When inventorying and valuating park facilities for insurance coverage and asset reporting.

Regardless of the trigger, this business process requires quick retrieval of maps and information about facilities and assets in the field. The fact that not all critical infrastructure data required in the facilities business process is readily available is because a.) Managers involved in facilities have not been involved in GIS data planning, and b.) There are no data management procedures for facilities and assets.

Figure 3-1 shows a high level view of business flow for the four highlighted programs in the facilities business area. There are several important problem areas.

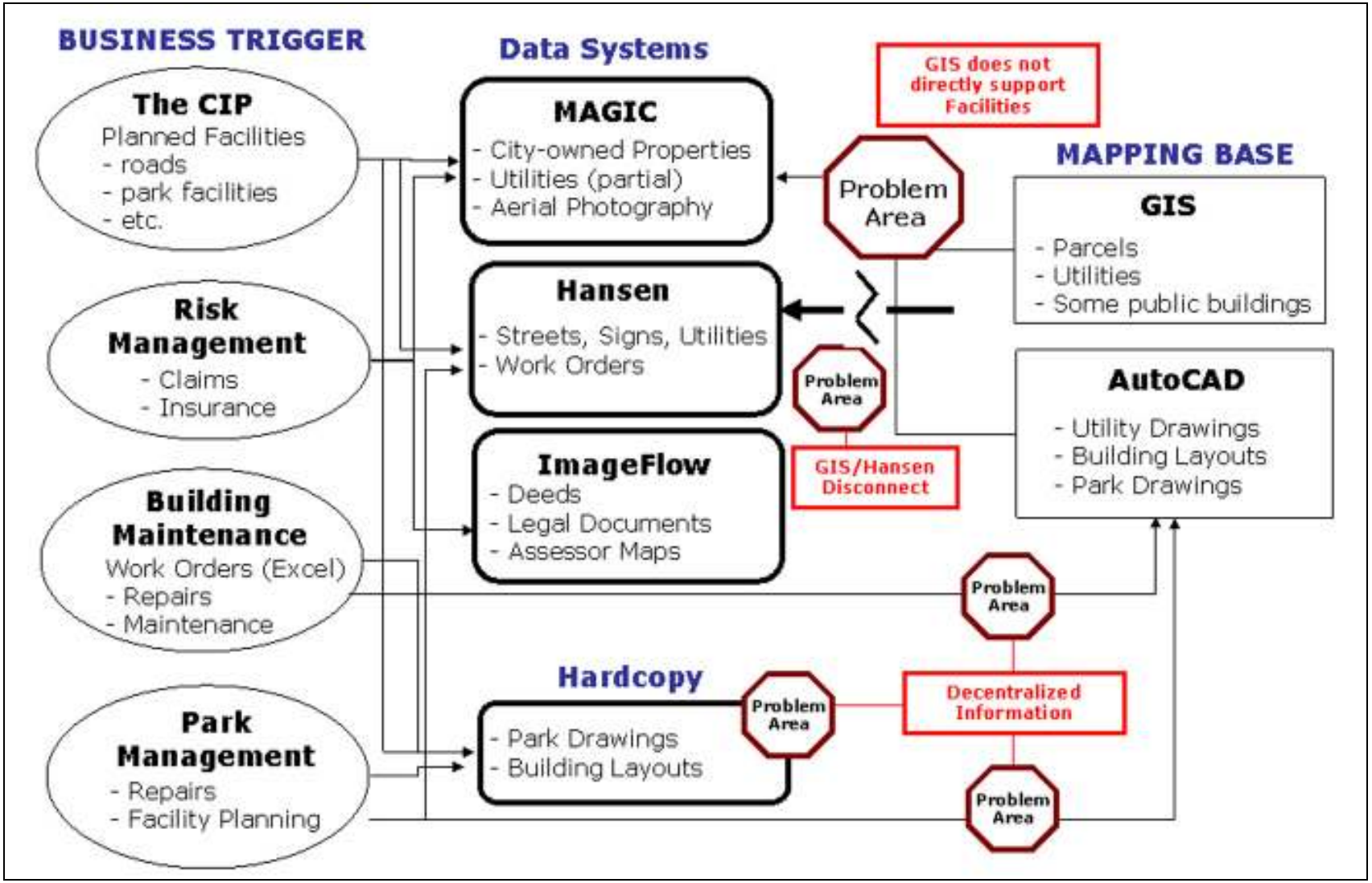

Figure 5-1. Facilities Business Flow—Existing Process

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for Facilities and Assets in Tigard, based on expressed common needs and overall GIS design implications. The above business flow diagram illustrates two important problems with managing and accessing facility information. First, there is a fundamental lack of information that directly supports the programs that plan and manage facilities. Arguably, GIS could play an important role in inventorying high priority facilities and assets. Second, there is no convenient and centralized location of facility and asset geospatial and attribute information. Staff who plan for and manage facilities and assets must go to several different data systems and hardcopy archives to do their job. There are several opportunities to improve this business flow, and it starts with some simple GIS data development and management strategies.

The first priority is to identify the highest priority geospatial features that support the facility and asset business area programs. These will likely include major facilities and infrastructure; however, may also include very specific features, such as speed bumps or hazard trees in parks, which offer Risk Management a clear way to reduce threats. Some of the high priority features may already be in GIS. Others may require extraction from CAD or a field inventory. Either way, this process should be combined with parallel efforts where possible.

Second, the prospective map viewer should include functionality defined by staff who works with the CIP, risk management, facility maintenance, and parks management. The viewer could offer some relief to the density of business flow arrows seen in Figure 3-1.

Finally, it should be noted that priorities for other business areas will directly benefit facilities and assets. A notable priority is better integration of Hansen and GIS.

CHAPTER 6.
LAND USE PLANNING

OVERVIEW

The City of Tigard has jurisdictional authority of land use planning within its city limits. The business area of land use planning within the City is separated into specific divisions. These are: Current Planning, Long Range Planning, and Building. The Community Development Department has primary responsibility for these business areas:

- Current Planning handles the day to day business of current development at the City. Their responsibilities include public counter services, land use and zoning code creation and enforcement, land use decisions, subdivisions, and maintenance of the legal zoning map.
- Long Range Planning takes care of a wide range of tasks in policy planning, including the following: affordable housing; comprehensive plan; economic development; transportation planning; natural resource protection; and area plans and studies.
- Building is responsible for building permits, building code enforcement, and inspections.

Land Use Planning is very customer service focused and makes use of information that is inherently spatial. Some processes involve daily interaction with the public, such as the counter service, where GIS data is needed immediately and online, and some work is on a more extended time frame, such as a long range planning projects, which may include data acquisition and analysis as a central component of the project. GIS has been used in Land Use Planning since 1989 and they are the most involved user of GIS at the City.

The primary business system within Land Use Planning is the permit system (Tidemark), which has no integration with GIS. GIS is used throughout the permit review process for looking up spatial information, such as Goal 5, flood plain, zoning, comprehensive plan, tax lot, and other information. Data is also extracted from the permit system to support long range planning projects, but the process is cumbersome. Addresses are also a key component of the permit system. User needs for addresses are detailed in a separate document.

Another key system used in land use planning is the ArcView 3 GIS application known as MAGIC. MAGIC is routinely used for counter service mapping activities, developing mailing lists, processing land use applications, and other research and mapping functions. MAGIC has several customized functions (such as buffer generation and address search) that are used in land use planning. Numerous land based data layers are maintained by Community Development and are made available to the organization through MAGIC. Land Use Planning uses data that is Tigard owned and maintained as well as regional data sets, such as Metro (RLIS-Lite), Washington County, and State data sets.

The following report will describe user requirements to support Land Use Planning activities, draft the business process flow for GIS use and access, and define issues identified in the Land Use Planning and Permitting workshops. The report will conclude with a summary of the highest priorities for optimizing the us of GIS to support land use planning activities in the City.

USER REQUIREMENTS

Land Use Planning is the biggest user of GIS at the City of Tigard, in terms of number of users, length of time using GIS, and data maintenance. However, there is a desire to move forward in the use of GIS to support land use planning activities. There are needs for improved data management, system and data integration, data quality improvement, and GIS access tools. The following section will outline detailed needs presented in the Land Use Planning and Permitting workshops.

User Needs

The work of Land Use Planning is highly dependent on the need for accurate and current information from a variety of sources, including those outside the City (i.e., Metro RLIS Lite data). Land Use Planning also generates considerable information via the permit system, GIS, and analysis results. In the Current Planning business area, staff deals extensively with the public and must provide information in a timely manner. Permits must be issued based on accurate, complete, and current information. In Long Range Planning, information is also taken from many sources to analyze conditions and provide forecasts of future conditions and impacts. Much of the information, such as Buildable Lands, must be summarized and reported to Metro, and the State. With Building, there is a need to know about all current conditions in the field, particularly for the inspection process.

Current Planning/Building:

- Confirm locations for citizens at the public counters and over the phone
- Confirm addresses and do research for permit requests
- Use a mapping interface to pinpoint an area and see as much information as possible from City utilities, records, critical areas, zoning, and any other information related to the parcel. There are limitations here caused by what is stored and how it is stored. All information may not be in a format that can be linked.
- Need to see Active Permits on a map, not just land use but other permits such as building, ROW permits etc.
- Use GIS to overlay and analyze property conditions to summarize issues and flags regarding a piece of property (e.g. floodplain, wetlands, zoning, etc.). Ideally, some standard overlays that are done in the background and can be loaded into the permit system or be available at the public counter via GIS.
- Provide Web access to planning and permit data for citizens
- Maintain information in GIS on partitions and subdivisions—streamline the process to do this currently cumbersome work, integrate better with business
- Support data extraction, integration, and analysis from the permit system
- Provide an easy means to use and compare permit system data and County data, particularly tying together the parcel ID numbers (TLID)
- A sidewalk layer would be great to support land use permits for streets
- Building footprints could be useful for locating building related issues
- Need a tree database and locations, particularly to support regulations for preserving significant trees
- Maintain a GIS layer of complete wetlands delineations
- Maintain an accurate and up to date zoning layer

- Need access to all relevant City boundaries and infrastructure, such as sanitary, water, City limits, etc.
- Need access to data in other City systems, such as Springbrook business taxes, Document Management (upcoming), Records database
- Generate mailing lists based on geography (usually buffers around parcels) using permit system addresses, County addresses

Long Range Planning:

- Access to demographic data to support grant writing and other research
- Good ability to create permit system data extracts and summaries for long range analysis
- Support reporting functions to Metro, and other agencies, via data extraction and summarization from the permit system
- Create revenue projections using permit system data and GIS

Building:

- Access to mapping and aerial photography, via a simple interface, to support field work
- Need good mapping of street information as it exists in the field—for example, need to see barriers to travel, private streets etc.
- Need to see Active Permits on a map, not building but other permits such as land use, ROW permits etc.
- Create revenue projections using permit system data and GIS

All Business Areas:

- Need GIS mapping capabilities to support mapping needs with good cartographic tools, pre-symbolized data, and standard layouts. 8.5 x 11 mapping is the highest priority.
- Need to extract information from permit system and see on a map
- Need to extract information from permit system and compare with County data
- Need to see or use Active Permit data in GIS
- Need access to data in other City systems via GIS, including but not limited to, business tax data and utility billing

Problems and Issues

In Land Use Planning, there are a number of key problems and issues that were expressed by the planners, technicians, and other staff:

- Need a revised TLID field (Assessor's parcel number) in the permit system so that extracted data will match directly with the County's TLID. Currently, there is a dash in the permit system parcel number that prevents easy use of the data.
- Much of the analysis work is cumbersome due to the difficulties in pulling data out of the permit system and then finding a way to work with it.
- The effort to maintain GIS information on partitions and subdivisions is difficult. When a parcel is subdivided, a TLID number is retired and lots with new TLID numbers are created, thus making it difficult to synchronize land use permits with an associated GIS layer of their

locations. The City needs to streamline the process to do this work and integrate better with the business flow.

- MAGIC is a widely used tool, but it falls short in several areas. There needs to be more data available and the cartography is poor. The need for good mapping tools is not met. Something like MAGIC is needed, but it should be designed more consciously with user needs in mind. The interface is not user friendly.
- There is a disconnect between data maintained outside the permit system and the fields in which it is stored in the permit system. For example, the zoning map is correct, but the zoning field in permits has not been updated.
- Darren is maintaining the street network, which does not seem to make sense from a Tigard business standpoint. This issue will also be discussed in the Streets GIS Requirements chapter.

Opportunities

Land Use Planning already creates and uses a great deal of GIS data, but there are also a number of opportunities to create better integration with existing systems and with GIS applications. Improvements to the permit system and the access to GIS data and capabilities will be key. Furthermore, there is a great opportunity for the Community Development Department to embrace and formalize its role as a primary GIS data provider for the City, including the designation of staff and the documentation of data creation and maintenance procedures. There are a number of goals and actions that will support the effort:

- Use the migration to Accela to improve the data storage for parcels (match to County format) and to enhance the data extracts and reporting for use in GIS. Automate and streamline processes that are repeated. It should be noted that the Accela migration is dependent upon budget approval and could be postponed until the next fiscal year (08/09); thus an interim solution should be planned for as a back-up.
- By matching to the County TLID, more automated comparisons between permits and the County will be possible.
- Another opportunity in the Accela re-design is to establish the business process and flow for maintaining non-permit data in the permit system. Should this be done at all or should non-permit data be accessed in a different way? What data should be stored there for viewing and how should it be updated in order to keep the system as up-to-date as possible?
- MAGIC will be replaced by a newer technology. It is a great opportunity, but its existing value should not be overlooked. There are many aspects of the tool that work very well. There are opportunities for improvement in data management and content, data symbology, cartography, ease of use, and pre-defined analyses. There is also opportunity to tie in better with other systems, particularly the permit system.
- A re-design of MAGIC could also include a look at providing GIS access to the public via the Web. The functions and tools of a new viewer/mapping tool for staff could be input for a tool for the public. These should be viewed.
- The definition and dissemination of a “base map” for use in accurate digitizing of new data (annexations, critical area updates, zoning modifications, and new streets if this responsibility persists), and the maintenance of existing data.

Data and Design Impacts

As this project moves forward into recommendations for solutions and action, there are several areas of data and design impact that must be looked at. In Land Use Planning, a lot of data is created and maintained. Also, data is pulled in from many sources. The interaction with the Public creates an additional set of needs for data and design. Finally, the needs for research and mapping create the need for a high quality user interface to GIS. Most of these have been mentioned in the previous sections, but they are summarized here together:

- Spatial data management—currently, there is a mix of people involved in GIS and spatial data management in Community Development. Darren Wyss handles most of the GIS data, both management and maintenance. Bethany Stewart is the lead staff person for updating addresses. Paul Izatt, moving to Public Works, has made considerable use of the permit system data and has created shape files from this data. In the data assessment component of this work, we will need to look at spatial data management overall, including how IT will fit into the City-wide picture. The roles and responsibilities will be reviewed and recommendations will be made. Community Development will play a significant role.
- A base map should be defined and incorporated into the City's Geodatabase design.
- Accela—with the move to Accela, there are data design opportunities to integrate and synchronize the permit system to GIS, both internally and with the County. The ability to map permits is a high priority. Address issues are also important (refer to Address Needs Assessment chapter).
- New data projects—Community Development staff indicated needs for new datasets. Some, such as sidewalks or system boundaries, would not be considered planning data. Coordination of these projects will need to be undertaken in the City-wide GIS planning context.
- MAGIC—the replacement of MAGIC is vital to the usability of GIS in Tigard. Good design will create the right tools to support the work of Land Use Planning and other business areas.
- Public Access to City GIS—this has potential to add value and service to the spatial data available at the City. It would tie in, particularly, with the permitting process.

BUSINESS FLOW

The business processes within Land Use Planning are disjointed and ill-defined with regard to spatial data. There is incredibly high use of GIS and spatial information but also a high level of frustration for the users. There are breakdowns in data transfer, updates, and connections among systems that likely can be repaired with some design work and data management efforts.

The following diagrams shows the existing flows and problem areas for spatial data within the Land Use Planning business areas. There are a few key problem areas where the process breaks down, as labeled on the diagrams.

Figure 6-1 shows a high level view of spatial data maintenance in Land Use Planning. There are several problem areas.

- The first is the maintenance of subdivisions and partitions. It is currently a shape file that has been put together without good maintenance connections to the Permit System where the updates originate. In terms of data design, this should be addressed.
- Another issue is the extraction of data from the permit system for use in GIS. The extraction is cumbersome and the TLID is not compatible with Washington County's TLID. This needs to be resolved. Ease of data extraction must also be addressed.

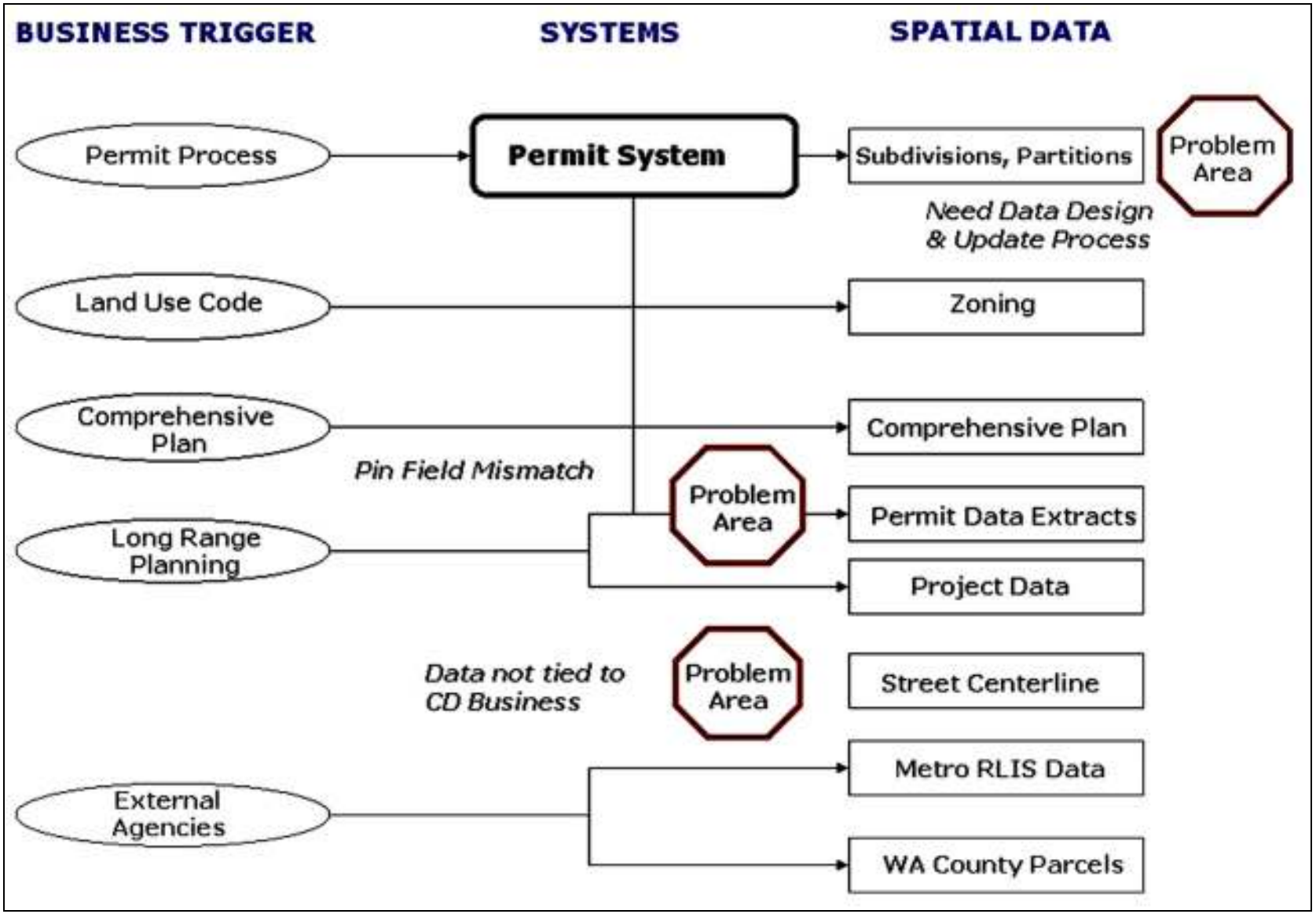

Figure 6-1. Land Use Planning Spatial Data Maintenance—Existing Process

- Finally, the City's street centerline is maintained in Community Development. This is a maintenance process that should be re-evaluated, since CD has no role in the City's street network business, outside of addresses. They may continue to play a role, but it seems that it does not make sense to have this data housed in this department. The appropriate staff should consider reviewing this data layer's maintenance responsibility.

Figure 6-2 presents a view of the flow and connections in using the Spatial Data to support Land Use Planning activities. There are a number of problem areas that are highlighted on the diagram. Overall, the diagram shows how staff gains access to GIS for their activities via MAGIC and ArcGIS, how data is extracted from the Permit System for use in GIS, and the lack of connection between GIS and other City business systems. The primary problem areas are:

- The Public does not have access to City spatial data for their property research, so they work through City staff. This creates considerable work for staff at the Public Counter that could be handled with some kind of Web Access. This type of access would require efforts in data management, content, symbolization, and quality, as well as some kind of application.
- The diagram shows a problem area with MAGIC. As described earlier, the staff has issues with MAGIC, particularly in mapping, ease of use, and limited content.
- There is a lack of connection and interaction with other City business systems. Staff has indicated that they would like to expand their GIS research capabilities to include much more City data. This interaction would also allow for cross-checking of source data between systems.
- As mentioned previously, the mismatch between the permit system TLID and the Washington County TLID must be resolved to streamline use of Permit data in GIS for analysis. Extraction tools are needed to allow mapping of permits.

SUMMARY OF PRIORITIES

This section summarizes the highest priorities for Land Use Planning in the City of Tigard, based on expressed common needs and overall GIS design implications. This section summarizes the highest priorities for GIS in Land Use Planning in the City of Tigard, based on expressed common needs and overall system design implications. These priorities will guide the recommendations for this project, as well as the approach for the data assessment and high level GIS design work to follow.

One of the fundamental priorities is the definition and incorporation of a base map into the City's Geodatabase, as a background for creating new GIS features and maintaining existing features. For Tigard, this will be a map that includes, at least, recent orthophotography and the parcels provided by Washington County. The re-design of the Permit System will provide opportunities to deal with the TLID mismatch issue that plagues the connection between permits and GIS. The Accela project should also include a look at the requirements for data extracts and at automating extract and comparison processes. For the permit system, it also needs to be decided how staff will view spatial data—Will there be a standard update between GIS and Accela, or will there be a way to link to the GIS from Accela? Overall, there needs to be an assessment of what connections are desired and possible between all City business systems. One of the highest priorities for Land Use Planning support with GIS is the re-design and deployment of improved GIS access tools to replace MAGIC. The detailed user requirements and design process will allow the creation of a tool that truly meets staff's needs. Consideration should be given to public access to City GIS data. This is not the highest priority, but the design and building of GIS access tools should support that possibility.

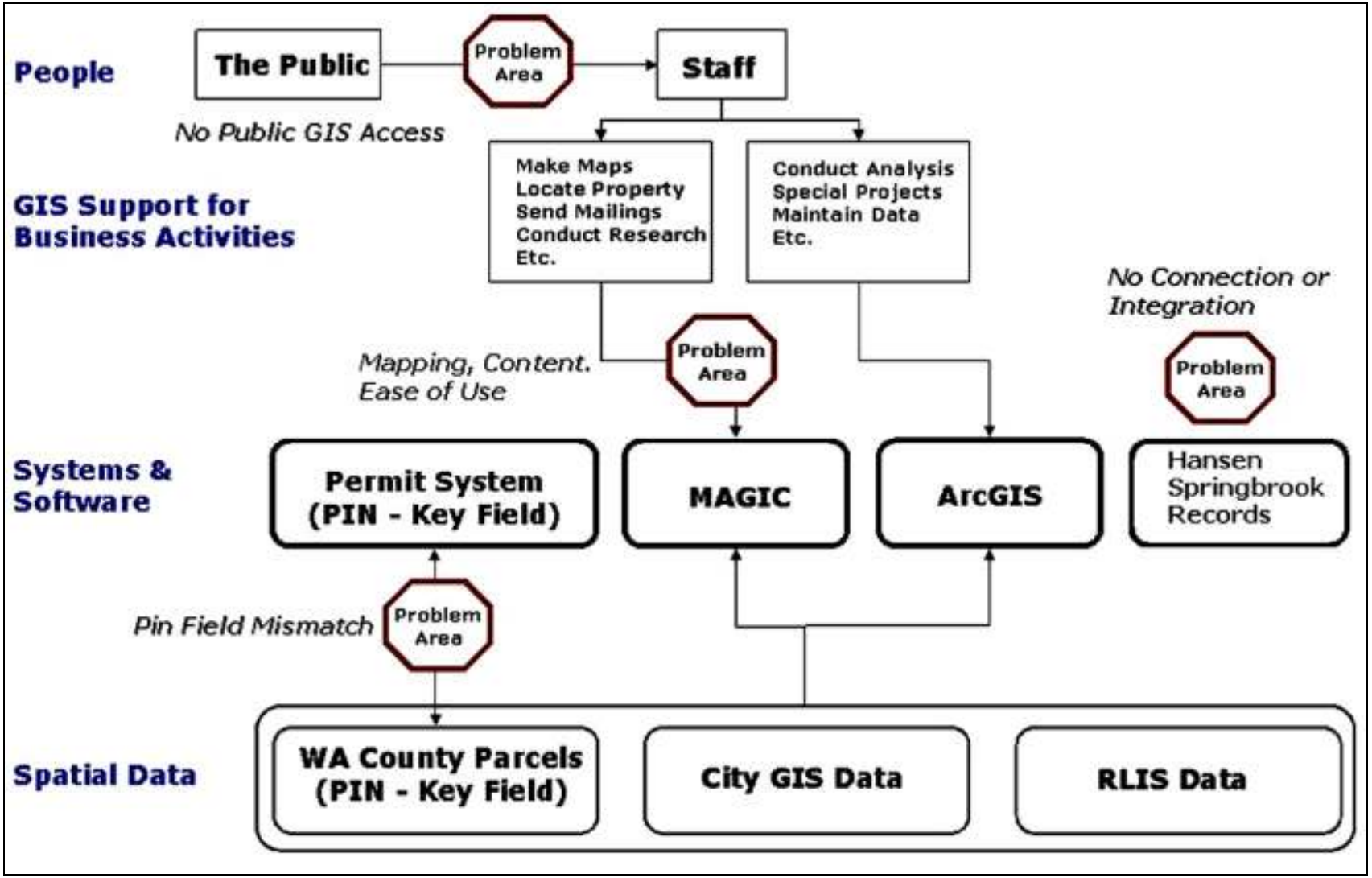

Figure 6-2. Land Use Planning Spatial Data Connections and Access—Existing Process

The final priority is data management. Planning work requires spatial data from many sources and also the creation and maintenance of a considerable amount of data. The data management needs to be tied into the bigger picture of City spatial data management, so that there are standards and tools available. Community Development has done an excellent job of creating, maintaining and using GIS to support the business of land use planning. Good data management will help to optimize this work and create a broader resource for the City as a whole.

CHAPTER 7.
CRIME ANALYSIS AND COMMUNITY POLICING

OVERVIEW

There are several facets of the City's police department that use, or have the opportunity to use, GIS. Tigard Police Department services include responding to critical emergencies and routine patrol operations, traffic enforcement, community policing, administration, investigation, evidence handling and storage, community relations, crime analysis, and youth programs.

Community policing includes 24 hour patrol within the five districts. During patrol, the most common need for a mapped address as well as real-time mapping is in response to a call. WCCCA 911 service support will receive a call and broadcast a dispatch to patrol officers in the field via radio through Computer Aided Dispatch (CAD) for emergency calls and text messaging to MDCs for lower priority calls. Patrol cars are equipped with mobile data computers (MDC) that receive all dispatch messages and allow the officer to confirm a response. The MDC contains a map viewer that feeds a "stick map" of roads with an address point depicting the proximal location of the incident; however officers do not have the ability to enter the address and receive directions or see their location on a map as they approach the location of a call. Vehicles also contain Thomas Brothers map books. These books are not being replaced due to cost. Older versions are still reasonably valid for a year or two. Motorcycles do not have GPS or MDC capabilities; however future expectations are that access to PPDS will be made available as the technology improves.

Of the approximately 28,000 calls made to WCCCA in a single year, about 8,000 end up in a report. Reports are completed by the responding officer and entered into the Portland Police Data System (PPDS) by Tigard Police Records. PPDS requires the entry of an address for the reported incident, and offers a mapping interface called the Crime Analysis Mapping Information Network (CAMIN2). CAMIN2 allows officers, who have access to PPDS terminals to map crime by type, geographic area, and date range using a simple GIS interface. Although the City supplies information for PPDS and CAMIN2, and benefits from data and maps provided by these systems, they do not have administrative access to customize their mapping and reporting functions.

An important use of police report data for the City is crime analysis. Patrol operations has a part-time Tactical Crime Analyst that uses reported crime from PPDS, as well as other data sources, for GIS analysis and mapping. The Analyst will take nightly downloads of Tigard reports from PPDS in an Access database, add comments to the incident based on the police report, and geocodes incidents that do not contain XY coordinates using the Metro streets layer or nearest parcel address using MAGIC. Maps are created in ArcView using symbology to subtype crimes. The maps are used for crime investigation, patrol deployment planning, and to a lesser degree, prevention programming.

Recently, as part of pilot project for the City's enterprise GIS, the City develop a web-based crime mapping application for use by the general public. This external application allows the public to enter an address and look at specific crime incidents in their community.

USER REQUIREMENTS

User requirements described in this document representing Police Patrol, Crime Analysis, and Community Policing focus primarily on the theme of providing patrol cars with the necessary data and technology to more effectively respond to calls for service and establishing better procedures and

practices for ensuring adequate reported crime location information, especially given the complexities of the City's use of a multi-agency information system designed and hosted by another City (City of Portland).

User Needs

Crime analysis and community policing were organized into two workshops. For the purpose of this requirements document, the two business areas were combined.

Patrol:

- Provide MDCs, or other means, with on-board navigation technology so that officers can see their location and enter, or automatically have it entered by WCCCA dispatch
- Access to more detailed in-vehicle maps for responding to incidents
- Provide officers with in-vehicle access to PPDS (or other suitable field device). NOTE: this is not specifically a GIS solution, but is identified here due to its level of importance for officers in the field.
- Police officers occasionally need to print out basic maps for use in municipal court

Crime Reporting:

- Ability to reference locations of incidents that do not associate with an address

Crime Analysis:

- Geocode incident locations quickly, especially locations that are not well referenced in the report
- Retrieve both historic and very recent incidents from PPDS
- After reading the officer's report narrative, the Crime Analyst enters synopsis in PPDS Access database and associates those comments to the incident point on a map and to the PPDS incident table

All Business Areas:

- Have access to a single master source of site addresses that supports all City systems that use a site address
- Provide ability to search for an area of interest by address
- Locate places in the field using an address
- Use address as the primary search vehicle in GIS based applications (like MAGIC)

Problems and Issues

While City of Tigard Police Department takes advantage of spatial and communications applications made available from PPB and WCCCA, the City does not have control over the data content of these systems. The CAMIN2 system uses street and address location data from Portland Metro. The in-vehicle maps on the MDC are from a proprietary mapping company. Although these data are regularly maintained by their owners, there is a natural lag in the update of new roads and addresses. Furthermore, responding officers would like more geographic context in the MDC maps, such as parcels. Because the maps are from an international proprietary source, they do not consume such local data layers.

Addressing for incident response and crime analysis remains a problem for the same reason as other business areas. Many locations such as vacant land, parking lots, and public parks may not have an address. Furthermore, reporting and geocoding incidents at the Washington Square mall are difficult because of the conglomeration of businesses, common areas, and parking lots on the property.

The police department relies heavily on PPDS and CAMIN2 for information on reported crimes in particular parts of the City. While Tigard Police Records usually has data entered in PPDS within 24 hours, there still may be discrepancies in the data (missing or incomplete data) that require the Crime Analyst perform post work to fully take advantage of the data for analysis purposes. This is an on-going training issue that has been identified by police management and is being addressed...

Tracking and analyzing traffic violations and crashes is not possible with the current system. Municipal court keeps a record of the number of citations issued and some violation type breakout but there is no way to know when or where citations are issued. Officers use their experience and anecdotal information to focus on citizen complaints of violations or locations where they know crashes occur. Officers also issue citations into Washington county Justice Court or Circuit Court for traffic crimes. PPDS does have the ability to capture and report citation data, but this is not done due to lack of resources for the labor intensive requirement for data entry. Only traffic cases involving criminal activity, such as hit and run, are in PPDS. Also, reliable accident data is also difficult to obtain due to the fact that police only investigate the most serious collisions. This is another resource issue. Since PPDS requires exact addresses for entry, obtaining even this limited data is not possible. The State of Oregon does not require police to investigate any collisions. It requires involved drivers to report collisions to DMV. This often results in inaccurate data that takes the State two years to analyze and compile into a report

Opportunities

The City's greatest opportunity to support community policing and crime analysis is in improvement of a site address layer, and to make these addresses available to the Tactical Crime Analyst for producing accurate and complete crime maps. This should expedite the process of crime mapping for daily operations. Already, crime maps are helping the City's police focus their patrol and crime prevention efforts, and there even more opportunities here.

There has been a lot of work done in the area of site addresses, but there are also great opportunities to refine the resource (see user requirements for Addressing). Ideally these addresses would directly feed CAD, PPDS, and CAMIN2; however, these systems are maintained external to the City and would require a complex integration of applications. The City's Community Development Department has been diligent in informing external street data providers of new addresses (such as Portland Metro and Navteq) and should continue to do so.

Although the City's police department has no administrative authority of CAMIN2, there may be opportunities to suggest modifications to the interface for easier crime mapping. For instance, allowing the query of an incident using a case number, or being able to query all premise types (rather than one at a time).

- Create a well designed GIS site address layer as outlined in the user requirements for Addresses
- Resolve site addressing for Washington Square, and other large commercial complexes
- Make the site addresses available to the Police Department via a geocoding service
- Automate the City's process of mapping crime points to make maps faster and easier using scripted geocoding procedures and standardized map templates for daily/weekly crime maps.

Data and Design Impacts

Insofar as GIS, police is mostly a consumer of data and is not responsible for creating spatial data used by other City departments. Police will directly benefit by the City's effort to create a complete and unified address layer and a well maintained street layer.

BUSINESS FLOW

The police department reflects a simple and linear flow of geographic information to complete its work. WCCCA communicates incident locations via a simple map to patrol officers via CAD and the in-vehicle MDC. If the incident requires a report, the officer files the report. Tigard Police Records enters the report data into PPDS. PPB replicates the data into a SQL server in Beaverton which is where Tigard pulls its data into an Access database accessed by the Tactical Crime Analyst... CAMIN2, hosted by PPB, offers a mapping system for participating agencies to view crime information. However, the Tigard police department still downloads incident records to do its own crime mapping and analysis using ArcView. Figure 7-1 shows a high level view of business flow for the crime analysis and community policing system.

Workflow: Patrol Problems

- The in-vehicle map on the MDC only gets an officer to the vicinity of an incident and offers no precise geographic information
- The MDC cannot display the location of officer in-vehicle display and cannot provide on-board navigation with map interface
- The MDC cannot access PPDS data and this issue can put officers in the field without an important tool needed for contact identification. PPDS can be used to transmit mug photos, for example. It is possible that PPDS can be delivered through wireless systems but these have not yet been fully developed and are expensive. The Bureau of Emergency Communications (BOEC) transmits PPDS to every police vehicle in Multnomah County over their 800 MHz system.

Workflow: Crime Reporting Problems

- The officer cannot report a precise "GIS-ready" location of the incident (such as an address or XY coordinate) when they occur at non-addressed places

Workflow: Crime Analysis Problems

- Tigard police cannot create a crime map of very current incidents (such for the previous day) because of the delay in uploading reports into PPDS. Loading is possible, usually within 24 hours; however it depends on availability of Records resources and the completeness of the data from the officer's report.
- The Tactical Crime Analyst must spend a lot of time locating incidents from PPDS that did not come with a location

Although the City's police department has limited ability to change the map interface in the in-vehicle MDC, they should use the proposed addressing base to supply PPDS with new and revised addresses, and extend the Geodatabase address layer to the Tactical Crime Analyst for more effective geocoding of incident.

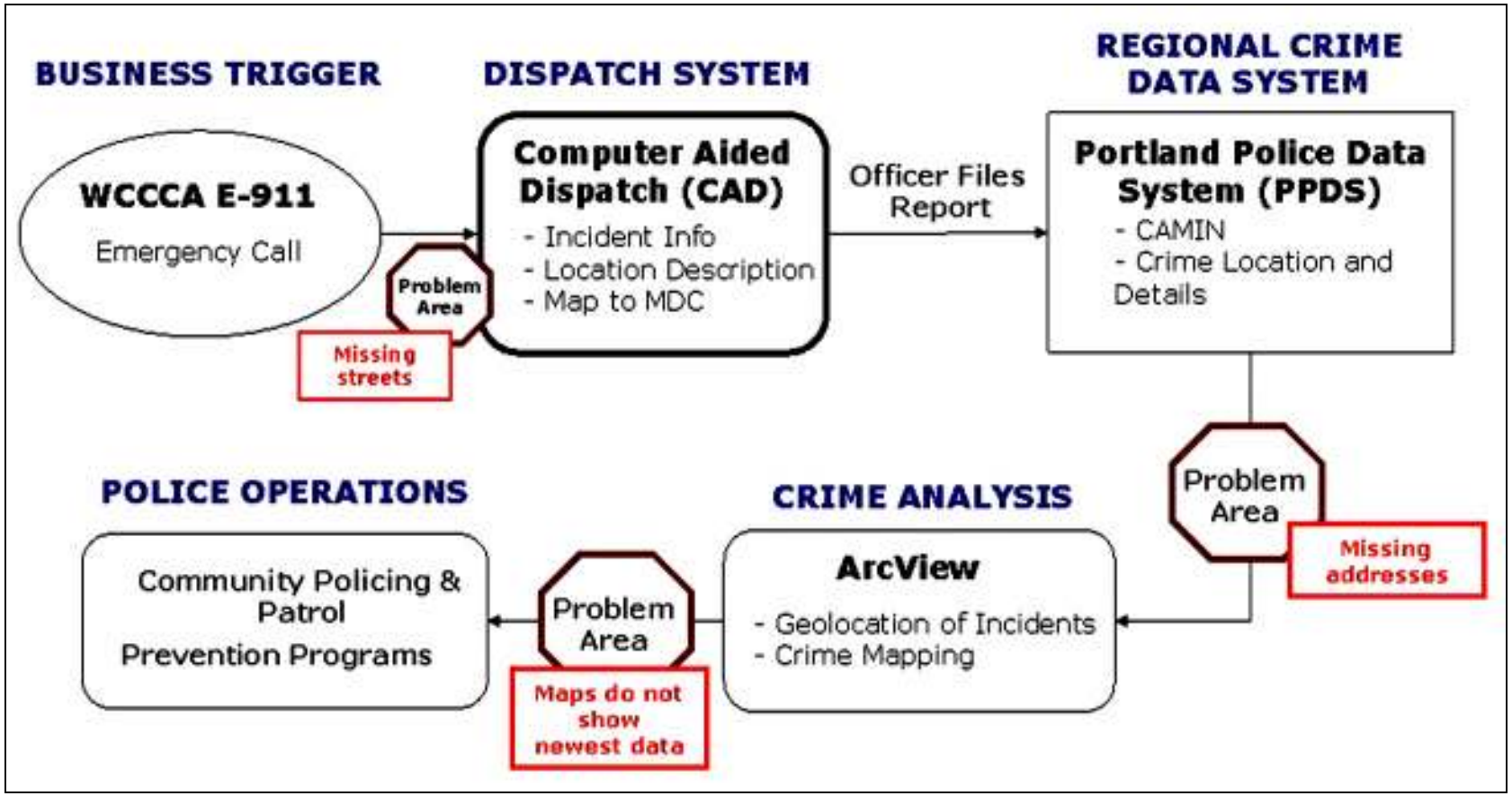

Figure 7-1. Community Policing and Crime Analysis—Existing Process

SUMMARY OF PRIORITIES

This section outlines the highest priorities for community policing and crime analysis in the City of Tigard, based on expressed common needs and overall GIS design implications.

GIS requirements for community policing include detailed in-vehicle maps and navigation for patrol and incident response. Both policing and crime analysis requires access to a consistent, complete, source of site addresses for crime reporting and geo-locating incidents. Furthermore, the Tactical Crime Analyst must make maps of recent crime activity to direct patrol efforts and prevention programs.

Problems and issues include lack of highly detailed in-vehicle MDC maps, MDCs lacking the ability to access PPDS, vehicles lacking on-board navigation to assist in directing them to a call for service, lack of completeness of site addresses, particularly vacant properties, the lag in data entry to PPDS, and the time required to make a crime map, especially with new data.

Opportunities include improved access to information within police vehicles MDCs, in particular real-time on-board navigation, access to PPDS, and the development and maintenance of a single and complete source for City site addresses, which would benefit nearly all of the business areas being reviewed. Furthermore, the City can make addresses available to PPDS and to the Tactical Crime Analyst for geocoding incidents that are missing XY coordinates. This would include supplying the Tactical Crime Analyst with access to the state-of-the-art addresses via a geocoding service

Finally, the City Police Department coordinates with other jurisdictions for its operations and reliance on centralized databases. Solutions related to this GIS needs assessment need to be considered in context of the other agencies. Some solutions may involve more business process oriented solutions, which inevitably require the need for close coordination and cooperation amongst the parties involved. For any of these types of solutions, the City needs to be willing to put forth the effort to help facilitate and make the appropriate changes.

CHAPTER 8.
DISASTER MANAGEMENT

OVERVIEW

The City of Tigard maintains an Emergency Management Program that organizes information and training programs, maintains an emergency operations facility, and maintains a response plan for a variety of natural catastrophic events severe storms, multi-hazard events (MH), and human-caused crises, such as terrorism. The program is managed by the Emergency Management Coordinator (EMC) who works in the City's Public Works Department. The EMC directly manages the City's response plan, the education and training of City employees and the Public (the Community Emergency Response Team, or CERT), the Emergency Operations Center (EOC), and coordinates with other agencies for preparedness.

The City is one of five agencies that comprise the Office of Consolidated Emergency Management (OCEM). Recently the City participated in a regional workshop that involved 17 emergency response sectors from the five county region. The sectors included representatives from transportation, water, and energy, to name a few. The objective was to identify and prioritize critical public and private infrastructure that is vulnerable in a disaster, and develop standards for security protection for each. Of 700 specific infrastructures that were identified, those which directly supported life safety and public welfare, as well as major economic impacts due to lost income and replacement costs were high priorities.

The resulting Disaster Response Plan was prepared by a consultant. It identifies several types of catastrophic events that may occur, and highlights critical infrastructure that are at risk (ranging from water supply lines to hospitals). There are a handful of GIS layers that inventory critical infrastructure, currently in a personal Geodatabase and used by Darren Wyss for preparing EOC maps. There are likely other critical infrastructure layers that should be identified for development or enhancement.

Emergency preparedness and response at the City involves the coordination and communication amongst several agencies and districts. The development and maintenance of the response plan, education and training programs, and management and staffing of the EOC relies on coordination of the City (primarily the EMC) and the Tualatin Fire District. In the case of an event, disaster management relies greatly on emergency dispatch (WCCCA 911 and CAD), the City's police department, the Tualatin Fire District, and, and external special response agencies and units depending on the type and proportion of the disaster. Tualatin FD has its own agenda for creating spatial data for response that could help the City's preparedness planning.

The EOC is the auditorium at the City's Water Building, which is converted into a command center when needed. A supply closet contains computers, communications equipment, maps, and other critical supplies. The City's GIS Specialist in the Community Development Department provides the EOC's hard copy maps using GIS. Sheets of acetate are supplied to create manual overlays for the hard copy maps. Although computers are available in the EOC, a GIS workstation, plotter, and access to data is not readily available.

Because community policing is covered in a separate document and Tualatin is a fire district managed outside the City, this assessment focuses on how GIS directly supports the City's Emergency Management Program, the job of the EMC, and operations at the City's EOC.

USER REQUIREMENTS

The Disaster Management team requires base maps and critical infrastructure layers of the City to plan for and effectively respond to emergencies. At a minimum, the team and the EOC must be supplied with up-to-date hard copy maps of the City's road network, buildings, railroads, flood plains, seismic hazard areas, landslide areas, storm water facilities, hazardous material storage, bridges, schools, shelters, fire stations, and the guard unit (this is a partial list and may include additional layers). The EOC staff must be able to draw event locations on these maps as a part of their emergency operations. Ideally, the team would be able to consume live GIS data of events, such as floods or plumes, and be able to map them "on-the-fly." Although the team has not created emergency evacuation routes in their pre-planning activities, a need for this in the future may arise.

User Needs

The Disaster Management team would equally benefit from citywide efforts to manage and maintain base map, facility, and asset GIS layers. Furthermore, the team must be able to create new maps quickly and easily.

- An inventory of critical infrastructure layers, what is mapped, and what is missing
- Regular updates to the high priority critical infrastructure layers in GIS
- Access to recent aerial photography, especially at the EOC
- A focused effort to map the location of special needs people and facilities
- Be able to map facilities and locations using MAGIC for pre-planning purposes
- Integration of the hazardous materials (HAZMAT) inventory done by Tualatin FD into GIS, preferably including building footprints, storage locations, and access points
- Access to the layers via the enterprise GIS using map templates for easy map production
- Supply the EOC regularly with current maps, primarily hard copy in case electricity is out or in short supply
- Have a dedicated staff person for regularly updating and printing maps
- Have "low-tech" options for mapping and locating features using lat/long or state plane coordinates on hard copy maps at the EOC
- Supplement hard copy maps at the EOC with live GIS mapping capabilities to create event maps and consume live data

Problems and Issues

The Disaster Management team expressed several concerns related to GIS and spatial data:

- Not all critical infrastructure data is centrally located and readily available (some is sequestered for security purposes but should be made available for emergencies and others may not exist at all)
- Too much critical information regarding the location of features, such as shut-off valves, facility entrances, etc., are not mapped
- There is no standard followed by Tigard or other local agencies and districts for creating and managing disaster-related data

- There is no direct connection to other regional emergency information systems, notably the Tualatin FD's plume mapping system
- Location of places without addresses is not possible using MAGIC
- The EOC does not have live GIS mapping capabilities
- The EOC maps do not have common referencing grids on the margins, such as lat/long or state plane
- The addressing grid system used by Tigard for emergency response differs from neighboring agencies
- The emergency notification system being acquired by the City ("Code Red") must be supplied with a standardized addressing system that is not yet adopted

Opportunities

The City and its Disaster Management team must take advantage of any opportunity to improve its critical infrastructure inventory and data delivery system for effective planning and response to a regional emergency.

- Work with other agencies to create a standard data model for building, managing, and sharing critical infrastructure data
- Work with partner agencies to identify disaster management data gaps and priorities for data creation and management
- Develop a data management plan that ties in with other City business related to critical EOC information, including work done by Tualatin FD for HAZMAT and the critical infrastructure layer being created for the CAD system
- Designate a person at the City to coordinate, manage and map disaster-related data
- Integrate all non-sensitive disaster-related data in the City's enterprise GIS
- Improve the map templates to include referencing grids
- Devise a map filing system in the EOC storage closet

Data and Design Impacts

The greatest impact to data and design for disaster management is a high demand for a standardized data model and a thorough inventory of critical infrastructure. The central issue for data and design impacts are content of key data layers, the completeness of those layers, and their availability to key staff. Some of these priorities for data content, completeness, and availability in disaster management may conflict with other business area priorities. For instance, the organization of the HAZMAT inventory done by Tualatin FD into the City's GIS does not satisfy daily business operations of planning or public works; however, the information is extremely important in the case of a rare disaster event. On the other hand, layers such as roads, addresses, and buildings are important to disaster management as well as several other business areas. For disaster management, the team must work with a designated GIS person, as well as related agencies and districts (notably Tualatin FD, Clean Water Services, WCCCA 911, and others) to develop priorities and methods for storing and managing this data. Based on comments at the workshop, the following data and design issues should be addressed:

- GIS layers from the Disaster Response Plan developed by a consultant must be moved from a Personal Geodatabase (PGDB) environment to an enterprise GIS. These layers will benefit other business areas and should be more universally available

- Missing and incomplete GIS layers of critical infrastructure must be identified and created
- The City should continue yearly subscription to Metro's aerial photography set.
- Roads, buildings, and addresses must be on a regular update cycle
- There must be a concerted effort to have Tualatin FD's HAZMAT inventory in the City's GIS for pre-disaster planning and mapping
- Ingress/Egress maps of major institutions should be mapped
- Mapped inventory of priority features—there should be separate workshop to decide exactly what are these unmapped features, which are priorities for disaster management, and a plan for getting them mapped

BUSINESS FLOW

At this time, the GIS Specialist for Community Development is the unofficial data manager and provider of maps for the EOC. He does not report directly to the EMC, nor does he have this responsibility in his job description. Data layers to support pre-disaster planning and mapping for the EOC come from several different sources, such as Portland Metro for the 911 road network, and Clean Water Services for flood zones. Figure 8-1 shows a high level view of business flow for the disaster management system.

Because of the importance of disaster preparedness, a business process that ensures management and maintenance of data, as well as preparation of current maps, is critical. However, this is not an easy task, and may demand data development efforts beyond the City's in-house ability. A proposed business flow for disaster management should start with a designated GIS person. It may be a person that works closer with the EMC in Public Works, or may remain the GIS Specialist in CD. Either way, it must be a part of his/her formal job description. The GIS designate must regularly update the maps for the EOC, and have procedures and protocols for managing data in his/her control. In the case of an emergency where the EOC is deployed the GIS person must be onsite for live mapping efforts. This will be addressed in the Strategies and Recommendations document.

SUMMARY OF PRIORITIES

The City has diligently participated in regional disaster planning efforts, has a general understanding of critical infrastructure in Tigard, and has delegated responsibility of coordinating the disaster response program to an official Coordinator (the EMC). The next step is to thoughtfully plan and implement the GIS to support this very important effort. This starts with a designated GIS person who represents the City's disaster management team.

The GIS person should coordinate a comprehensive list of data gaps for disaster management. Because this may be a monumental effort, there should be an effort to coordinate disaster data development with parallel business areas, notably in the mapping of critical infrastructure (water, sewer, buildings, and critical public facilities and institutions). Furthermore, this effort needs to be integrated into the daily responsibilities of a data steward so that the information is accessible come time of emergency. An effort to build a priority list of which data layers must be created, enhanced, and regularly managed (working with related agencies and districts to accomplish this) must be ensued. Later, a standardized data model for storing and deploying the data should be created, including a schedule of map updates for the EOC. Finally, a way of organizing and filing the maps in the EOC storage closet should be done, with an investigation of the level of effort required to bring "live" GIS to the EOC.

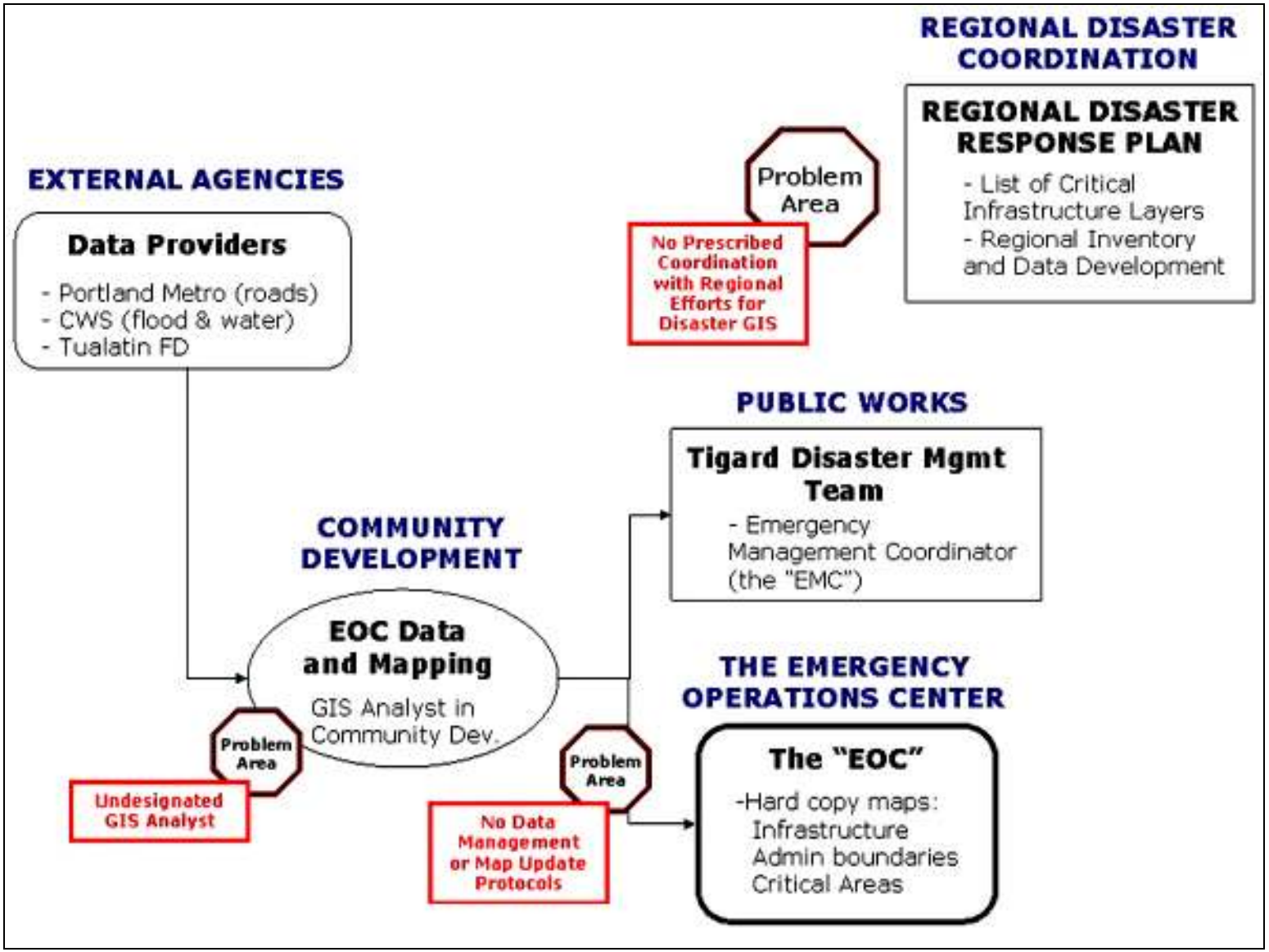

Figure 8-1. Disaster Management—Existing Process

CHAPTER 9.
LIBRARY SERVICES

OVERVIEW

The City of Tigard Library serves a population of 64,000 in the City of Tigard, King City, Durham, and Metzger (unincorporated Washington County). They use a Web based system called Polaris to manage circulation and accounts. When a new patron comes in for a library card, the staff uses Portland Metro's Web based system called MetroMap to determine whether the patron is within the service area.

Given the library's service population and high level of use, staffing is limited. Although there is interest in providing staff with GIS training, it is not likely that any staff member will have time to become a trained GIS expert. The reference desk is limited to helping people do their own information searches. They cannot spend too much time with any single customer. Furthermore, the library's director would like to use geographic research to analyze service populations, but must rely on City staff outside the library for this assistance. However, there are a few ways in which GIS can help.

The Library stores records that have a geographic location, such as historical photographs. Ideally, these would be catalogued by location to make research easier for the patron. Anything that makes information easier to find is helpful. For example, a GIS viewer that allows a person to do simple research on Tigard might be a possibility if it is easy enough to use. Another area in which GIS could serve the Library is in the understanding of its customer base, both existing and future. GIS has been used with Census data to conduct service sector analysis, to determine potential user populations. Analysis has been done in GIS by mapping the locations of those who have checked out books. It is important to keep addresses in the system as good as they can be. There have been issues with stolen books, CD's etc. and the items are impossible to track without good address information.

The following report will describe user requirements to support Library Services with GIS and draft the business process flow for GIS use and access, and define issues identified in the Library Services GIS Requirements workshop. The report will conclude with a summary of potential for optimizing the use of GIS to support Library Services in the City.

USER REQUIREMENTS

Library Services does not anticipate creating GIS data or developing technical expertise to conduct analysis. However, they are interested in products and GIS access to improve their customer service. The Library does not have a high level of need for GIS; however, there are some areas that were identified in the interviews. The following section will outline the needs presented in the Library Services workshop.

User Needs

Library Services has some needs with which GIS might be able to provide some useful assistance:

- Confirm location of patrons within service area for obtaining library cards
- Conduct research and analysis that will improve services to library patrons and help to plan future requirements for new services
- Track materials and reduce theft
- Assist patrons in conducting research at the Library

- Catalog materials by location when appropriate, including historical documents and photographs.

Problems and Issues

In Library Services, there are a number of key problems and issues that were expressed by the staff:

- Tigard's GIS does not cover addresses in the full service area for the Library
- Customer addresses may not always match when geocoded.
- There is not a GIS viewer at Tigard that can be used to verify addresses. Addresses are verified using MetroMap, which is provided by Portland Metro via the Web
- There is no in-house analysis capability for doing service sector analysis using patron and Census information
- Census information is not readily available or widely used at Tigard
- Historical photos and other documents are not catalogued by geographic location. It is sometimes difficult to research these documents because of the lack of location information.

Opportunities

Library Services does not use the GIS extensively to support their work. However, within the current GIS design and planning efforts, there are a few opportunities that could benefit the Library:

- Improved site addresses will assist the Library in tracking patrons more effectively. Even if MetroMap is still used, the addresses within Tigard will be improved.
- The review of GIS needs indicates a potential for making more use of Census data. This could support the Library
- In determining how GIS services will be provided, the Library should be considered as requiring services that they cannot handle in-house.
- The development of a replacement for MAGIC may provide tools that can be used by Library patrons for everyday research

Data and Design Impacts

There are a few areas in the GIS needs for Library Services that impacts the overall GIS design.

- The service area coverage for the Library should be considered in the work on addresses
- Census data is important to Library service sector analysis and the Library should be considered when determining what Census data should be kept and how it might be used.
- Possibility for use of GIS at the Library by patrons should be considered in the detailed user needs for a replacement of MAGIC.

BUSINESS FLOW

The business flow for Library Services is quite straightforward; it is well managed by the Polaris system for circulation and account management. The OCLC inter-library loan system manages sharing of materials among regional libraries. Regarding GIS, access to site addresses is important. Access to GIS research functions for patrons is a possibility for the future. Figure 9-1 shows a high level view of business flow for the library system.

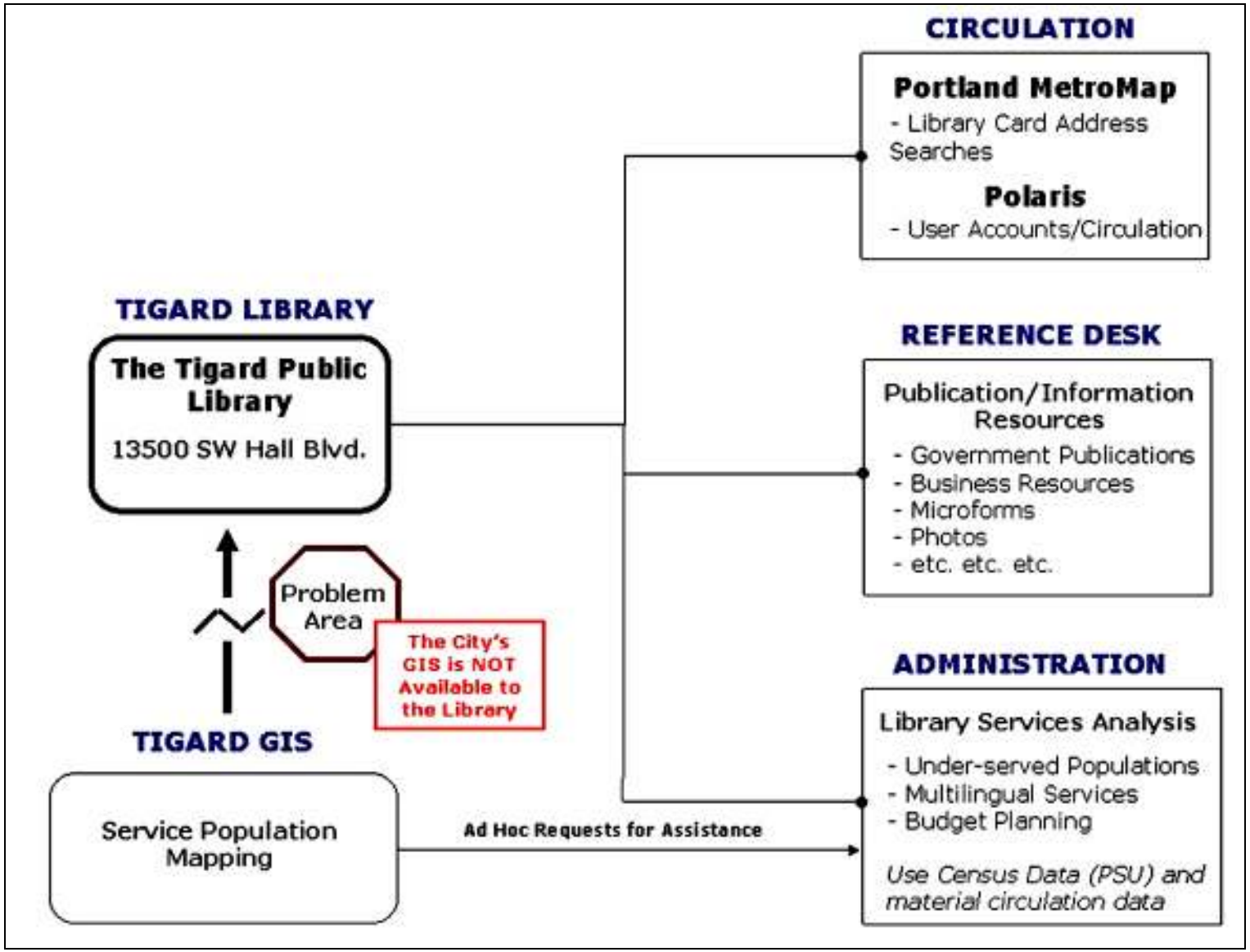

Figure 9-1. Libraries—Existing Process

SUMMARY OF PRIORITIES

This section summarizes the priorities for using GIS to support Library Services in the City of Tigard, based on expressed common needs and overall GIS design implications. These priorities will help to guide the recommendations for this project, as well as the approach for the data assessment and high level GIS design work to follow.

The Library's highest priority is to serve its constituents with quality materials, assistance, and research. GIS can provide improved tracking of patrons and materials. It may also provide a new research tool for patrons to use at the library in their own research. One specific potential project is the development of a GIS based system to store and access historic photographs and materials. This would provide a means to open these documents up to a wider audience using GIS search tools. Finally, GIS can be used to conduct analysis that can be used to fine tune the Library's efforts towards their existing and potential customers.

APPENDIX A.
MARCH 6, 2007 WORKSHOP MINUTES—
ENVIRONMENTAL MAPPING

June 2007

City of Tigard GIS Needs Assessment

Workshop Title: Environmental Mapping
Workshop Date: March 6, 2007

Primary/Secondary Facilitator: Preston Beck
Participants: Loreen Mills, Carla Staedter, Greg Berry, Darren Wyss, Paul Izatt

Summary of Business Area

Environmental mapping includes visualizing, querying, analyzing, and reporting on environmentally related features and conditions within the City's jurisdiction. Environmental features in the context of this business process review include, but are not limited to floodplain, sensitive areas (e.g., riparian corridors and wetlands, other sensitive areas defined by Goal 5), tree canopies, streams, and surface water quality, and responding to claims filed against the City.

Environmental mapping occurs in several departments at the City of Tigard, including Community Development, Admin (Risk), and Public Works. In general, environmental information in a map-based environment plays a support role in other decision-making within the City, especially as it relates to the development review process (permits), and monitoring conditions of environmentally related programs.

Only a couple of environmental layers are actually maintained by the City. The majority are maintained by other jurisdictions and shared with the City. Essentially, there is a strong desire of staff to have improved access to environmental information as well as the ability to establish other 'secondary' GIS layers to support existing environmentally related programs within the City (e.g., the City's Surface Water Quality Improvement Program).

Department Specific Business Uses of Environmental Information

Risk Management

Risk uses environmental information to assess the conditions of a site. This process is important when acquiring property, selling property, or beginning City projects on a particular site. In general, these mapping related activities can be described as locating features and establishing the conditions of features at a given site. Loreen described other information of environmental related mapping, which generally falls into the category of environmental hazards (such as chemicals on a site or underground storage tanks). This information is equally important to the due diligence process of Risk. Since Environmental Hazard mapping was not explicitly defined as a business process, this review will provide partial documentation so that if there is a need to further document requirements of environmental hazards, this information can serve as a starting point.

Public Works

Public Works primarily uses environmental information for planning purposes and to support the existing Surface Water Quality Improvement Program. Planning activities revolve around the use of environmental information for evaluating new public works facilities. The Surface Water Quality Improvement Program deals with a significant amount of environmental information; however, the program is very limited in terms of the development of its own specific map layers to support specific program components. One of these components includes Healthy Streams (stems from Clean Water Services), which involves restoration of habitats. Currently, the ability to monitor and report on

restoration progress is limited due to the lack of mapped information of the restoration initiatives. Additionally, mitigation sites are supposed to be more adequately tracked, but this is currently accomplished through recorded deed restrictions. The ability to map the spatial locations of the mitigation sites in the future would benefit tracking requirements.

Another program within public works is the Adopt a Trail program. While the adopt a street program is currently mapped, the trail program is not.

Engineering

Engineering uses environmental layers primarily for general look up and preliminary site evaluation related to project development. MAGIC serves as the primary mapping application to provide this information. During the survey process environmental features are identified more accurately through surveying. This information is captured in Auto-CAD drawings, which are currently not created with a spatial reference. As built drawings are generally the best reference as they show historical information, have more detail, and allow for better scaling.

Community Development

Community Development uses environmental information for planning related activities as well as the development review process (permitting). Information is currently accessed through MAGIC. In depth mapping activities and ad-hoc mapping projects, such as those associated with City's role in Goal 5 mapping are conducted using desktop applications (ArcGIS and to some extent ArcView 3x). Community Development also maintains specific environmental data. These include maintaining the local wetland inventory, tracking the location of FEMA LOMARs (Letter of Map Revision). Community Development shares environmental data with Clean Water Services, but there is no structured process or schedule.

User Requirements (Provision Summary)

Expressed Requirements

The following list specific requirements as summed up through the environmental mapping interviews.

1. Access to environmental information is improved and made more widely available to casual users beyond the City's current available inventory and delivery of environmental information.
2. The enterprise GIS has the ability to integrate environmental information in GIS with existing programs (such as the Surface Water Quality Improvement Program).

Expressed Opportunities

1. There is a significant opportunity to improve monitoring and measurement of success/progress of existing environmental programs by using GIS.

Expressed Problems

1. Lack of easy access to environmental information and to perform simple queries/look ups
2. Lack of knowledge of information presently available within the City's current system.

Business Flow Diagrams (where appropriate)

None provided.

Required Data Systems, Data Layers, and Information Relationships

Data Systems

From this review of environmental mapping needs, it appears that some of the tracking and monitoring desired in the Surface Water Quality Improvement Program may need an information management system along side any GIS application development. Other information identified through this exercise should be able to be provided through an enterprise GIS and associated application development within the GIS.

Data Layers

ENVIRONMENTAL RELATED DATA LAYERS	
Layer	Currently in City's GIS
CWS Streams	Yes
Goal 5 Layers	Yes
CWS Vegetated Corridor	Yes
Local Wetland Inventory	Yes
FEMA Floodplain	Yes
FEMA LOMAR Sites	Yes
1996 Flood Inundation	Yes
Zero Rise Floodway	Yes
Mitigation Sites	No
Restoration Areas	No
Adopt a Trail segments	No
Water Quality Facilities	Yes (only public)
Tree Canopy	No
Impervious Surfaces	No
Tree Inventory	No
Underground storage tanks*	No
Bio-plumbs*	No
*Environmental Hazard Related	

Summary of Priorities

User Requirements

In general, user requirements focus on having access to environmental information. Most comments centered on having easy access the environmental information and to be able to visualize it in a map based environment. This is followed by the request for simple attribute and querying options, as well as simple map making tools.

Problems

There are several environmental layers that are maintained by other jurisdictions and are available to the City. Incorporating these into GIS and related applications is relatively straightforward. Challenges will likely occur when new layers are desired. This is especially true with layers that are associated with information tracking and monitoring. These activities typically involve database and application design and development work. In addition, departments desiring to create new environmental layers will need to be able to establish an ongoing maintenance program to ensure reliable information is being stored and accessed in an enterprise system.

APPENDIX B.
MARCH 9, 2007 WORKSHOP MINUTES—
URBAN FORESTRY

June 2007

City of Tigard GIS Needs Assessment

Workshop Title: Urban Forestry
Workshop Date: March 9, 2007

Primary/Secondary Facilitator: Preston Beck
Participants: Steve Martin, Ron Bunch, Gary Pagenstecher

Summary of Business Area

Urban Forestry is a comprehensive program and the City of Tigard and includes several components, including heritage tree preservation, tree protection, a tree ordinance, and sensitive area restoration programs involving tree planting. The Community Development Dept. is in the process of developing a comprehensive tree protection plan, of which will be followed by an actual urban forestry program.

Urban forestry as it relates to GIS includes using GIS as an analysis tool for monitoring resources to evaluate how the City is achieving its urban forestry goals, such as along stream corridors and right of ways, within parks and other areas. This information is in turn also used for policy and decision-making, such as increasing forestry canopies.

Urban forestry management also comes into play during the development review process. Under certain conditions, an Arborist Report is required. These reports, which include an accompanying site plan, identify existing trees, trees to be removed, trees to be protected, a tree mitigation plan, and a monitoring plan. It is believed that many of the components of the Arborist Plan could be extracted and placed into GIS in order to improve monitoring and compliance of land use approvals.

Currently GIS is not used to track tree inventories or other urban forestry activities, however it is believed there is much opportunity to improve existing programs by have information in GIS.

User Requirements (Provision Summary)

Expressed Requirements

The following list specific requirements as summed up through the urban forestry interviews.

3. Staff require a map-based environment to store, track and monitor specific components of Arborist Reports, including existing trees, trees to be removed, trees to be protected, and tree mitigation plans.
4. Staff requires a map-based environment to store, track, and monitor, City Heritage trees and trees targeted for preservation.
5. Staff requires a map-based environment to store inventories of existing street trees.

Expressed Opportunities

2. There appears to be an opportunity to use components of the Arborist Report in GIS. Useful tree inventory, mitigation plan, and other tracking and monitoring information is shown on the Site Plan and can be transferred into GIS. If obtained in digital format, the information could be transferred into GIS more easily.

Expressed Problems

3. Currently no process or resources are set up for extracting Arborist Report information, or obtaining location information of street trees.

Business Flow Diagrams (where appropriate)

None provided.

Required Data Systems, Data Layers, and Information Relationships

Data Systems

It appears some of the tracking and monitoring related to tree mitigation may require some specific database work. Tidemark or its future replacement may have the ability to set up ticklers for checking on compliance and certain dates established during the land use approval process. This will need to be investigated further.

Data Layers

URBAN FORESTRY RELATED DATA LAYERS	
Layer	Currently in City's GIS
Heritage Trees	No
Trees targeted for Preservation	No
Street Trees	No
Tree Mitigation Plan information	No

City of Tigard
GIS Needs Assessment

APPENDIX C.
MARCH 8, 2007 WORKSHOP MINUTES—
PARKS MANAGEMENT

June 2007

City of Tigard GIS Needs Assessment

Workshop Title: Parks Management
Workshop Date: March 8, 2007

Primary/Secondary Facilitator: Preston Beck
Participants: Steve Martin, Duane Roberts

Summary of Business Area

Parks management includes operation, maintenance, and planning of City of Tigard park facilities. City parks facilities include city parks, greenspaces, and off-street trails and multi-use pathways. The Parks Department activities are guided by a Parks Master Plan, which was completed in 1999. An update is scheduled for the 07-08 fiscal year. Mapping and analysis in the Master Plan was completed by an outside consultant.

The Parks Department focuses on much of the day to day operation and maintenance of its facilities, but also coordinates with Community Development for trail planning, grant writing, land acquisition, and long range planning activities. Maps for grants, such as site maps, are currently provided by staff in Community Development.

In addition, the City uses an online parks reservation system supporting parks management. The online system is used to reserve picnic shelters and fields.

User Requirements (Provision Summary)

Expressed Requirements

The following list specific requirements from the Parks Management interview session.

6. Park assets need to be in GIS so they can be not only mapped, but also then tied to an asset management system
7. The trail system would benefit by having a referencing system (e.g., mile point) for maintenance activities
8. Park base maps need updated and incorporated with the enterprise GIS as the current ones are old static maps.
9. Hard copy maps provided with park reservations need to be improved as the current ones are not very legible and are of poor quality. The online reservation system does not provide any mapped location of facilities (e.g., picnic shelters).
10. An ongoing (annual) buildable lands inventory would aid in planning activities related to land acquisition for park facilities. Currently the buildable lands study is not on a regular update schedule
11. A map based tracking mechanism for trail easements/greenspaces would significantly help in monitoring compliance as well as planning future trails. There is currently no mechanism other than researching land use files and plats. Community Development sees this as a priority.
12. The online system for parks reservation would benefit by being able to determine if an address is located within the city limits as reservation fees vary by whether the person making the reservation lives within the city limits or not.

Expressed Opportunities

3. There is a significant opportunity to improve asset management and maintenance of park facilities by mapping such facilities and integrating the information with the City's asset management system (Hansen).

Expressed Problems

4. The timeline for purchasing the parks management module in Hansen is probably 18 months out.

Business Flow Diagrams (where appropriate)

None provided.

Required Data Systems, Data Layers, and Information Relationships

Data Systems

It appears from this review of Parks Management, developing GIS layers and applications need to be accompanied by development of Parks Dept's assets with the City's asset management system

There is a strong interest in revamping the online park reservation system as it as several shortcomings. Included within this would be allowing the online system to verify if addresses are within the city limits or not.

Data Layers

PARK MANAGEMENT RELATED DATA LAYERS	
Layer	Currently in City's GIS
Park Assets (e.g., shelters, maintenance buildings, restrooms, parking lots, benches)	No
Trail Easements/greenspace dedication	No
Valve boxes	No
Trail Linear Referencing	No
Trail Mile Point Posts	No

Summary of Priorities

User Requirements

Overall, the Parks Dept highest need is to map its assets in order to improve operation and maintenance activities. The mapping needs to be accompanied by linking assets within an asset management system. With assets mapped, further initiatives like improving park base maps, exhibit maps, and online maps can follow. In addition tracking of trail easements and greenspace dedications also needs to be a priority in the City's GIS.

APPENDIX D.
MARCH 9, 2007 WORKSHOP MINUTES—
TRAFFIC MONITORING

June 2007

City of Tigard GIS Needs Assessment

Workshop Title: Traffic Monitoring
Workshop Date: March 9, 2007

Primary/Secondary Facilitator: Preston Beck
Participants: Vannie Nguyen, Gus Duenas

Summary of Business Area

Traffic monitoring encompasses the collection and analysis of traffic volume and related information on roadways within Tigard. Information is used as input on traffic studies and as a tool to monitor traffic trends over time. The Engineering Dept receives data (from ODOT on State maintained facilities) as well as collects its own traffic data on local streets. The City's collection of traffic volume data on its local street network is conducted on an irregular basis. There are no permanent count stations embedded in any of the roads and tube counts are not necessarily done each year at the same location, thus there are gaps for various sites preventing adequate trend analysis.

Traffic count machines collect raw data out in the field. The software associated with the machines is used to download the raw data and create standard reports summarizing the 15 minute increment data, usually collected over a 72 hour period. The raw data is printed and stored as hard copies in files. Only the summary data is placed into a custom built Access database, including ADT (Average Daily Traffic, volume for both directions), speed, and truck percent.

Traffic counts are also done in conjunction with traffic studies or as part of a neighborhood complaint program for analyzing speeding traffic in neighborhoods. If neighborhoods complaints on traffic speeding meet certain criteria the City will initiate a traffic study, which may result in the recommendation of traffic calming or other improvements.

User Requirements (Provision Summary)

Expressed Requirements

The following list specific requirements as summed up through the traffic monitoring interviews.

13. Engineering needs a more efficient environment for display of summary traffic information. Engineering believes a mapped based environment will substantially improve visualization and communication of traffic conditions and trends on the City's street network.

Expressed Opportunities

4. Data has been loaded into a Access database and is available for integration into GIS

Expressed Problems

5. The lack of a consistent data collection program may not provide reliable trend information for sites; however, this could be improved if counts are performed at sites on a routine basis.

Business Flow Diagrams (where appropriate)

None provided.

Required Data Systems, Data Layers, and Information Relationships

Data Systems

It appears from this review of the traffic monitoring program that most of the work related to making traffic monitoring information available in GIS is on establishing consistent data at sites and committing to routine data collection in order for the information to be useful for other people accessing the information in a mapped based environment.

Data Layers

TRAFFIC MONITORING RELATED DATA LAYERS	
Layer	Currently in City's GIS
Traffic Count Site Locations (with count attribute information)	No
Speed Bumps/Cushion	Yes
Bulb-outs	No
Signals	Yes

Note:

This interview process also included a brief discussion of traffic accident monitoring. In discussing potential GIS needs for traffic accident information it was concluded that the information is not a priority for inclusion in the City's GIS at this time.